

MODERN Machine Shop

HOWARD CAMPBELL, Editor

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AUGUST, 1936

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A Magazine for Mechanical Executives: Construction Production Maintenance

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MODERN Machine Shop

CINCINNATI, OHIO

VOL. 10, No. 3

AUGUST, 1936

Interesting Operations in the Building of the Norge Refrigeration Unit

(Conclusion)

BY HOWARD CAMPBELL

Inasmuch as the parts of the Norge refrigerating unit must fit so accurately that leakage of gas will be impossible, lapping is employed to a large extent in the manufacturing of these parts. In Fig. 11 is shown a special lapping machine designed for lapping the bellows shields, the shield being placed on the spindle of the machine and the spindle being operated at a high rate of speed while a cast iron lap, made in the shape of a ring, revolves under the end of the shield.

The piece is held by means of a draw bar which expands a tapered plug in a collet, the plug being expanded inside the hole, and thus gripping the work. A mixture of 600 Aloxite lapping powder and oil is used on the lap and probably 0.0001 in. is removed from the surface of the bellows shield in this operation. Four machines are employed continuously on this operation, producing surfaces on the shields which are so perfect that no gas can escape.

Norge compressor "rollators" are lapped on both ends on the Norton lapping machine shown in Fig. 12.



Fig. 11—The ends of bellows shields are lapped on a cast iron lap containing lead inserts, spaced at regular intervals.

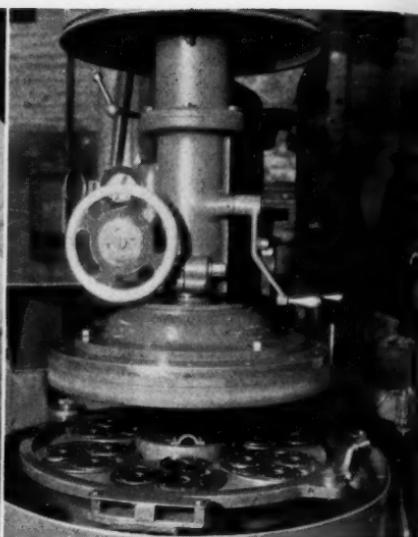


Fig. 12—Norge compressor "Rollators" are lapped in this Norton Lapping Machine. Fig. 13—Cast iron cylinder suction discs are lapped to size in this machine. A flood of oleum spirits expedites the operation.

The rollator is of cast iron, and is made in the form of a cylinder ground to 1.9983—1.9979 in. outside diameter and honed to 1.1882—1.1885 in. The piece is lapped on both ends to 1.3587—1.3591 in. with the equipment shown.

The rollators are held in a fixture which has six rings, each of which will hold three rollators. As the machine operates, the rings revolve and move slowly around the face of the lap, thus bringing the end surfaces of all the workpieces into every position possible between the upper and lower laps. The ends of these pieces are lapped to a flat mirror finish and when finished are parallel within 0.0002 in. total indicator reading.

The illustration Fig. 13 shows the lapping of cylinder suction plates, which are flat gray cast iron discs, 3 27/32 in. diameter and 5/16 in. thickness. The plates are rough and finish ground before lapping. To

hold the work properly, the Norton lapping machine is equipped with discs each of which has apertures for three suction plates, as shown. Both sides of the plates are lapped simultaneously. The work is lubricated by a flood of oleum spirits while the machine is in operation. The pressure between the upper and lower lap should be approximately 250 lbs., in order to obtain the best results, and the amount of pressure exerted is recorded by a Federal dial indicator which is located within plain view of the operator. Fifteen pieces are lapped at a time, the lapping operation removing approximately 0.0005 in. of stock from each side.

Shafts are lapped in the Shrane lapping machine shown in operation in Fig. 14. This machine employs strips of abrasive cloth as the lapping medium, three rolls of the abrasive cloth being located so that each strip of cloth can be held in contact

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Fig. 14—
Strips of

with the shaft while the shaft is revolved at a high rate of speed. The cloth feeds automatically so that fresh abrasive cloth is presented to each shaft as it is placed in the machine.

The end of the shaft is held in a head that reciprocates horizontally while at the same time spinning the shaft at a speed of 300 r.p.m. Approximately 0.0001 in. of material is removed in this operation and the shaft is polished to a mirror finish.

The ends of the rollator having been lapped to a mirror finish, the inside diameter is also finished to a mirror finish with the aid of the equipment shown in operation in Fig. 15. The machine is a Barnes honing machine, equipped with a Micromatic four-stone hone and special fixture.

The piece is located in the correct position by means of a pilot, which, upon moving a lever at the right of the fixture, rises to engage the hole in the workpiece. When the workpiece is properly centered and clamped, the pilot is lowered again, leaving the hole free for the entrance of the hone. The hone removes approximately 0.0001 in. of stock, finishing the piece to 1.1882—1.1885 in. The limit for taper is 0.0002 inch.

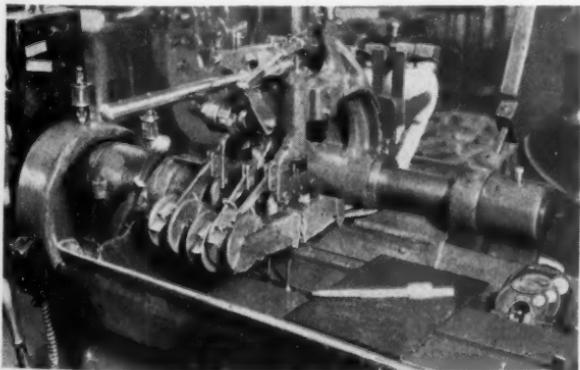


Fig. 14—Shafts are lapped in this Schraner lapping machine. Strips of abrasive cloth, fed automatically, are employed as the lapping medium.

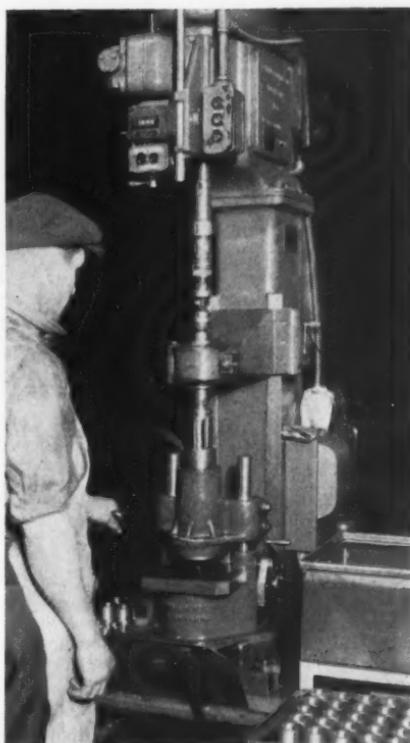


Fig. 15—The interior surface of the Rollator is honed to a mirror finish with this Barnes honing machine and a 4-stone hone.

It is obvious that such close limits and excellent workmanship can only be maintained where facilities are available for checking the operations after they have been performed. Accordingly, the inspection department is equipped with the very latest and finest devices for determining the accuracy of the machining operations.

The inspector shown in Fig. 16 is testing a compressor body for the accuracy of the face with the bore. The part is placed on an arbor which

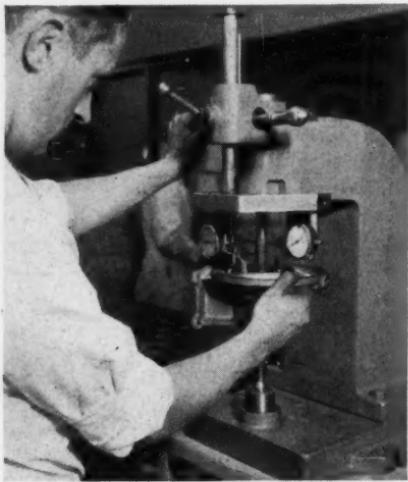


Fig. 16—Testing the face of a compressor body for accuracy with the bore.

is held vertically between centers and is then rotated by hand while the Federal gages shown attached to the machine indicate the accuracy of the face and the bore of the flange. The maximum limit on both of these faces is 0.0004 inch.

One of the most accurate parts of the entire machine is the fit of the cylinder blade in its slot in the compressor cylinder. These blades are held to a thickness of .2495-.2499 in. and the clearance between the blade and the slot must be not greater than 0.0005 in. The operator shown in Fig. 17 is selecting a cylinder blade, using a Sheffield gage for the test.

The illustration Fig. 18 shows the equipment which is used for making the vacuum test on the seal

bellows assembly. The seal, indicated at A, is set on a rubber block which has a hole in the center that is connected by means of a tube to a vacuum pump. With the seal in position over the hole, a master block is set on the top of the seal and a standard Norge unit is used to develop a 28-in. vacuum. If the surface of the seal is imperfect, thus allowing air to be drawn in, mercury will be forced up into one side of the U-shaped tube. If the seal is perfect, the mercury will remain at an even level in both sides of the tube. Even though the imperfection may be so minute as to be impossible of detection by any other means, when this vacuum is created, the mercury will slowly but surely begin to rise in one side of the tube.

An interesting feature of this piece of equipment is that a thin film of oil forms a cap over the mercury in either side of the tube and thus prevents the mercury from oxidizing. It also keeps the tube lubricated.

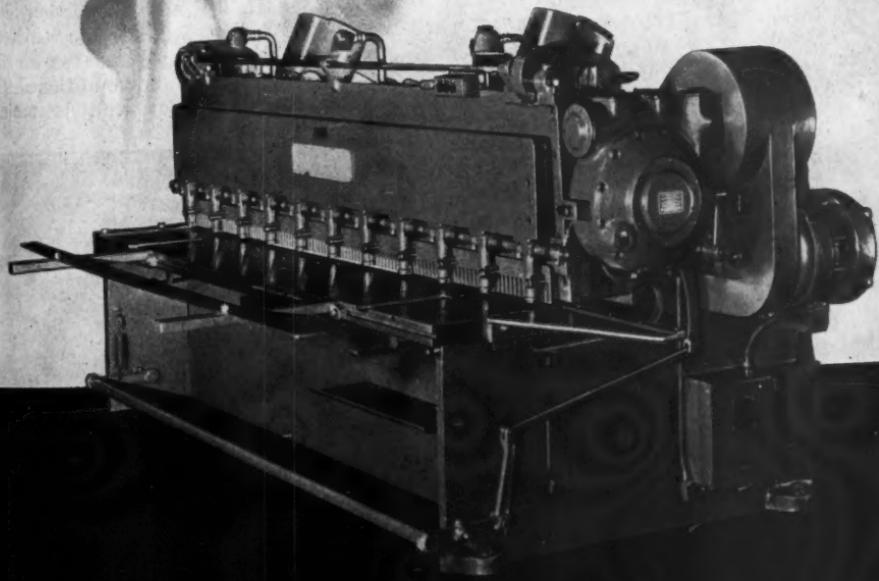


Fig. 17—The cylinder blade selected for each compressor cylinder must fit in its slot with a clearance of not more than 0.0005 inch.

Fig. 19 shows one section of the assembly department where the Norge units are assembled. The units are assembled on a power conveyor which



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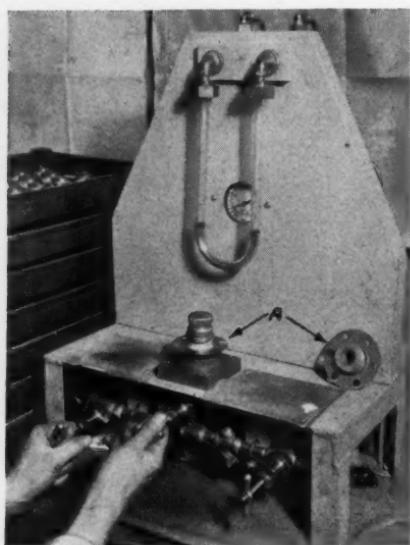


Fig. 18—Testing the seal bellows assembly, using a vacuum tester.

forms practically a moving work bench. At regular intervals the conveyor is equipped with plates to which studs are fitted so that the

compressor bodies can be temporarily attached and thus held in the proper position for assembling of the accessory parts.

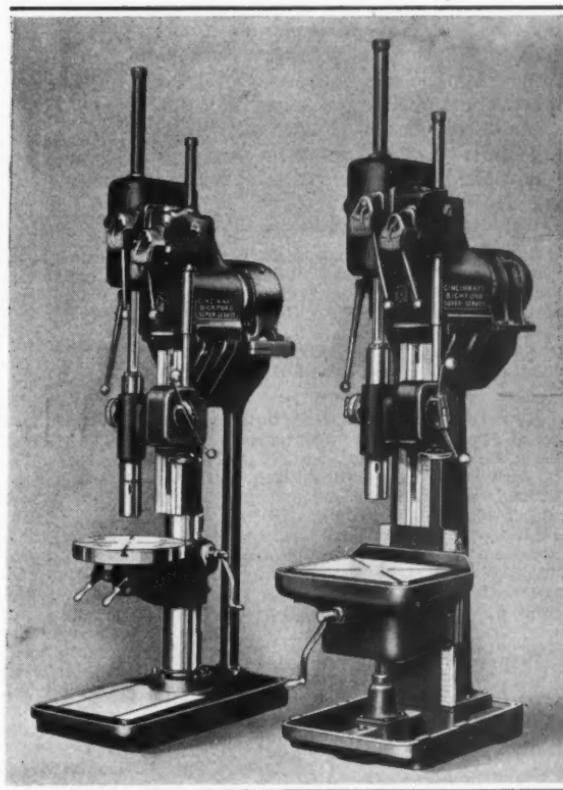
At the farther end of the room the bodies are first fitted to the fixtures on the conveyors, then the suction plates and shafts are assembled. As the conveyor moves the unit along, the roller is assembled to the shaft and the cylinder and cylinder blade and bearing plate are assembled. As the unit reaches the end of the line the dome is put on together with the seal unit and then the unit is filled with oil. At the end of the line it is removed from the conveyor and placed on a running-in stand where each unit is given a four hours' running test. Upon the completion of this test, each unit is given a volumetric and air test in which it is checked under 150 lbs. air pressure for air holes or leaks.

The assembly and inspection departments are lighted by modern mercury vapor lamps and the air in these departments is conditioned to the proper humidity and is main-



Fig. 19—Assembling "Norge" Refrigeration Units.

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tained at 72 deg. Fahrenheit. It has been found that in order to work to the extremely fine limits required for the proper machining, inspection, and assembling of the Norge refrigerating unit, the air must be properly conditioned and even temperature maintained at all times.

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How to Drill Square, Hexagon, Octagon, Pentagon and Triangular Holes. This 28-page booklet, issued by Watts Bros. Tool Works, Wilmerding, Pa., describes in detail the design and use of the Watts Angular Hole Drilling Tools. Included in the text are descriptions and illustrations of Watts tools in use for drilling square, hexagon, triangular and other shape holes in various types and sizes of work. Copy free upon request.

Elapsed Time Records. A simple but 100 per cent effective method of keeping track of the time spent on each and every job and operation is outlined in a booklet which can be had by addressing the Calculagraph Company, 52 Church St., New York, N. Y. The booklet explains the method of operation of the Calculagraph, which is a small recording clock that shows immediately the exact processing time both on men and machines. Where the Calculagraph is used it is impossible for a workman to forget to record the time of stopping or starting a job or to make an error in the calculation of elapsed time. Copy free upon request.

Turning and Boring Practice. By Fred H. Colvin and Frank A. Stanley. 453 pages, 6x9 in., 405 illustrations. Price, \$4.00. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York, N. Y.

This practical book is at once a complete training course in the operation of turning and boring machines and a guidebook of all the information that is important in the profitable selection and use of these machines in shops both large and small. In plain, descriptive

language the book gives equal attention to the various makes and types of machines in representative use, presenting the reader with data on the manner of construction, the possibilities and limitations of the machines, step-by-step instructions in the operation of the machines, the selection of tools, feeds, speeds, and so on—in short, everything the operator and the man responsible for results needs to know in order to get the best out of these machines. The material presented is from authoritative sources and includes many tables and data never before published in any book.

Finishing Metal Products. By Herbert R. Simonds. 337 pages, 6x9 in. 147 illustrations. Board covers. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York, N. Y. Price, \$3.50.

The importance of the finish of metal products has increased greatly during the past few years, from the point of view both of sales and manufacturing economy. This book gives the plant executive and his assistants all the way down the line to the finishing room foreman, information from which may be determined the best kind of finish for a specific product and the best technic for producing this finish. Both technical and commercial aspects are considered in detail so that good finishes may be produced economically on a mass production basis. Newly developed finishes are described, as well as new equipment and new straight-line processes.

The book is divided into six parts, altogether containing 19 chapters. Part 1 covers the commercial aspects of finish and appearance; Part 2, preparation for the finish of metal products; Part 3, polishing and buffing; Part 4, plating and spray coating; Part 5, painting and Part 6, special finishes.

Because such preparatory processes as cleaning and descaling are so closely associated with the final finish of a metal product, a number of chapters are devoted to these processes and to their relation to metal finishing technic. Altogether, a new approach to the subject of finishing is here presented. In addition to covering shop technic, finishing processes and finishing problems are coordinated with the over-all problem of manufacture.

An important feature of the book is the description of experiences of some manufacturers in increasing sales and in reducing sales expenses through changes in the character of the finish of various products.

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Methods Engineering Installation: Mapping Out the Program

The concluding section of this article, giving formulas for determining the extent of the methods engineering program.

By H. B. MAYNARD
President, Methods Engineering Council, Inc., Pittsburgh, Pa.

On special purpose machines, the labor content is usually low, and a type C study would be indicated. On punch press work which requires an operator to feed in blanks and remove finished parts, a type A study will be justified if the job is at all repetitive. General purpose machines handling a varied line of work may profitably be subjected to the type D or type E study. A little used machine such as a broaching machine in a general machine shop might not justify more than the type F study.

These few examples will suffice to show in a general way how various types of methods study are applied to various classes of work. The following table may be used as a more exact guide in determining the type of methods study applicable to any given operation or class of work.

This tabulation is based upon the average conditions encountered in industry, but it is a reasonably accurate guide to follow in mapping out a methods engineering installation program. Where a choice of two or more types of study is indicated, the particular conditions surrounding the job will determine which type is best.

To permit the accurate application of the table, all terms must be de-

fined. The repetitiveness of the operation cycle, of course, means the number of times a given cycle is repeated in exactly the same way. Generally an operation cycle is repeated once per piece, but in special cases, such as the steam turbine blading example given above, a portion of the cycle only may be repeated frequently on one major part.

The degrees of repetitiveness are more difficult to define with exactness, because both the number of repetitions and the length of the operation cycle must be considered. For example, a job with a yearly activity of 50,000 pieces might or might not be considered a highly repetitive job. If the length of the operation cycle were .200 hour or 12 minutes, the total length of the job would be 10,000 hours. Thus 5 operators working 2000 hours per year would be required. This would be a highly repetitive job and would justify intensive methods study. On the other hand if the job were an operation consisting of punching out parts with a multiple cavity die, and the time allowance per piece were .0002 hour, the entire job would last only 10 hours, and it would be considered to be of low activity.

In general a job may be considered

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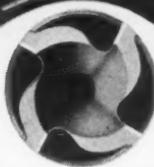
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Repetitiveness of Operation Cycle	Labor Content	Life of Job	Type of Study Indicated
High.....	High.....	Over 12 months.....	A
		Over 12 months.....	A or B
		Over 12 months.....	B or C
	Medium.....	Over 12 months.....	A or B
		Over 12 months.....	B or C
		Over 12 months.....	C
	Low.....	Over 12 months.....	B
		Over 12 months.....	B or C
		Over 12 months.....	C
Medium.....	High.....	6 to 12 months.....	B
		6 to 12 months.....	B or C
		6 to 12 months.....	C
	Medium.....	6 to 12 months.....	B or C
		6 to 12 months.....	C
		6 to 12 months.....	C or D
	Low.....	6 to 12 months.....	C or E
		6 to 12 months.....	C, E or F
		6 to 12 months.....	F
Low.....	High.....	Under 6 months.....	C or D
		Under 6 months.....	C, D or E
		Under 6 months.....	C or E
	Medium.....	Under 6 months.....	C, D or E
		Under 6 months.....	C or E
		Under 6 months.....	C, E or F
	Low.....	Under 6 months.....	C or E
		Under 6 months.....	C, E or F
		Under 6 months.....	F
Jobbing.....	High.....	Under 6 months.....	E
		Under 6 months.....	E or F
		Under 6 months.....	F

highly repetitive if it consists of not less than 2,000 pieces per year and requires not less than 1000 hours to complete. Expressing this algebraically, if the formula

$$N \times TA$$

$$\frac{1000}{}$$

where

N = No. of pieces—not less than 2000
 TA = time allowed

gives a value of 1 or greater, the job may be classed as highly repetitive. The value of N = not less than 2000 is a fairly arbitrary figure and may be varied to suit individual conditions. The formula takes into account the three variables which must be considered, however, namely, number of pieces per year, length of operation cycle, and total length of job, and hence offers a valuable guide.

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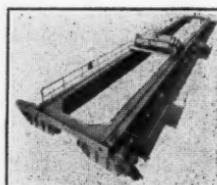
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A job may be said to be mediumly repetitive if it has not less than 500 pieces per year and lasts from one to six months. To be considered mediumly active, therefore, the following formula must give a value of one or greater.

$$N^1 \times TA$$

167

where N^1 is not less than 500.

A job of low repetitiveness may consist of not less than 50 pieces per year and may last from two weeks to one month. The formula would be

$$N^2 \times TA$$

80

where N^2 is not less than 50.

It must be clearly understood that these formulas should be looked upon as a guide only and that they should be applied with judgment. Used intelligently, however, they offer a ready means of determining the repetitiveness of a job from the standpoint of the type of methods study which can profitably be made.

The formulas are used as follows. A representative job in a machine shop is selected to test the type of methods study which is desirable. This particular job has an estimated activity of 5000 pieces per year. The first operation is a lathe operation on which a time allowance of .392 hour is established. By substituting in the formula

$$N \times TA$$

1000

a value of 1.96 is obtained. This operation would be classed as highly repetitive.

The next operation consists of drilling and tapping two holes. The time allowance is .025 hour. Substituting in the same formula a value of .75 is obtained. This operation is not highly repetitive. Therefore the

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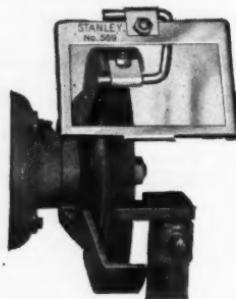
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The Stanley Works

New Britain, Conn.



next formula is used or

$$N^* \times TA$$

167

This formula gives a value of 4.5 to the job may be classed as of medium repetitiveness.

A number of representative jobs are tested similarly, and as a result a good composite picture of the repetitiveness of the work is obtained.

Labor content is more easily defined. The maximum condition, of course, is when all work is performed by human labor, and the minimum is when the job is done automatically by machinery. An operation cycle in which over 75 per cent of the time is consumed by human labor may be said to have high labor content. An operation cycle on which 25 per cent to 75 per cent of the time is human labor has medium labor content. Below 25 per cent human labor, the job has low labor content. Most machining jobs where the cutting is done under power feed have medium labor content. The length of life of the job is self-explanatory.

From the information given above it is a comparatively easy matter to decide upon the kind of methods of engineering work which may be profitably undertaken. If the review of number of representative jobs determines that type A or type D studies are desirable, the plant will be justified in purchasing motion picture equipment and conducting intensive methods studies. If the majority of jobs indicate a type C study, then less detailed program will be mapped out.

In any case, however, the work should be done by trained men. Whether type A studies are required or not, a better grade of work and greater results will be obtained those who are doing the work have full knowledge of the principles of motion economy.

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Fig. 1—Cutting grease from cellar screens for reclamation.

Reclamation of Grease at Pennsylvania Shops in Columbus

BY BARTLETT WEST

THE Pennsylvania R. R. Shops at Columbus, Ohio have installed a highly efficient and low cost plant for the salvaging of locomotive grease lubricant and grease screens, and the forming of grease cakes and plugs of a size and shape to suit their various classes of equipment.

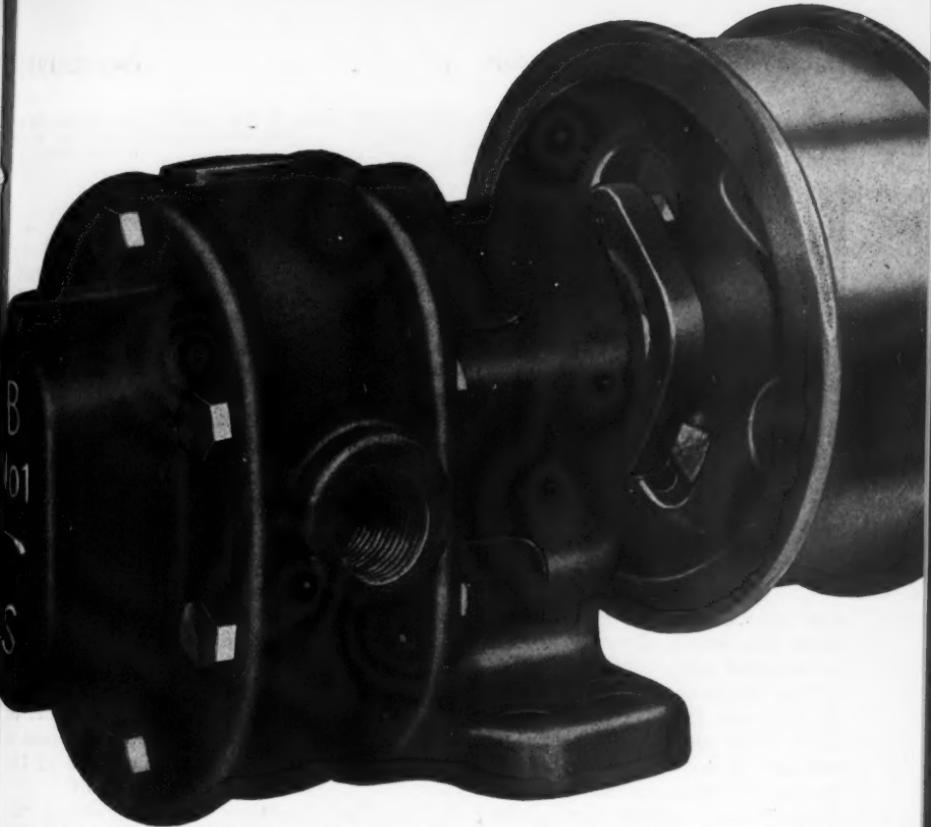
The locomotive grease cellar screens in which the grease cakes are held to form are received at the reclamation plant with the old grease in them just as they are removed from the driving box cellars. They are turned over to workmen who remove the grease from them as shown in Fig. 1, the work being done on a table built of steel plates and angles. As the grease is removed, that which is too dirty or worn to be reclaimed is separated from that which is still clean and in good condition. The old or rejected grease is dropped through a hole in the table into a steel barrel placed there for that purpose and is afterward scrapped, and the remainder, or good grease, is retained for forming into proper shape to be used again.

After all the grease is removed

from the screens, the screens are placed in a wire basket which is then lowered into a lye vat as shown in Fig. 2. The vats in which the screens are submerged are built of boiler steel with hinged covers. The lye solution used is heated to the boiling point by steam which is sufficient to loosen any grease or dirt that was not removed by the first operation.

After the screens have been thoroughly cleaned in this manner, which usually takes from 30 minutes to one hour, they are removed and the lye and any remaining grease and dirt is washed off with a hose. A monorail hoist is used to facilitate the handling of the basket in and out of the lye vats.

The grease removed from the cellar screens is the only grease salvaged, and is collected and received from other points in the region. New grease comes in wood barrels from which it is usually removed by taking the barrel apart and leaving the grease in a huge solid mass as shown in Fig. 3. The machine shown in this illustration, upon which the grease has been placed, is built for



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Fig. 2—The screens are boiled in a lye vat solution until the last remnants of grease have been removed.

the special purpose of cutting the mass into small pieces so that it can be handled more easily.

The machine consists of a steel frame made from heavy channel iron, supporting an 18x13-in. driver brake cylinder at each end with a table between, the table having a hole in the center over which the grease is placed, as shown. To the end of each piston rod is attached a horizontal knife made from $\frac{3}{8}$ -in. steel and 43 in. wide which rides in guides at either side.

One of the horizontal knives carries three vertical blades and the other carries two, each 6 in. high and welded to the horizontal knives.



Fig. 3—Breaking up a mass of new grease that has been received in a barrel.

These blades are spaced so that they interlock. By opening a single valve, air is admitted to both cylinders simultaneously and the knives move toward the center of the table, cutting the lower end of the grease mass into small pieces which drop into a box under the machine. It takes but two or three minutes to break up a barrelful of grease. The pieces are later removed to the grease-forming machine.

Figure 4 shows a workman pressing the reclaimed grease into cakes which will be used, in this case, on freight locomotives. The grease is put into a hopper on the machine from which it is forced, by means of the piston on an air cylinder, into a chamber from which it exudes in the form shown in the illustration.

The cylinder through which the grease is passed is 14 in. in diameter and 27 in. long over the heads, and is steam jacketed. As the grease issues from the chamber, it passes through a die which gives it the re-

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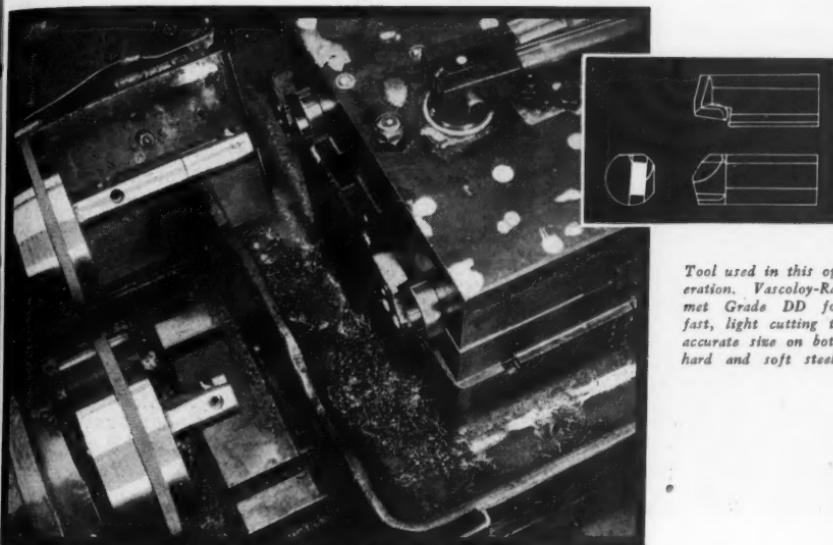
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quired shape. Different sizes and shapes of dies are used to produce the various sizes of grease cakes required, and the dies are easily



Fig. 4—Air is used to force the grease out through the die, forming it into the required shape.

changed on the machine by the loosening of the nuts on a few studs.

While the grease-forming operation has been taking place, the screens have been cleaned and reshaped preparatory to fitting them to new grease-cakes. To restore the screens to their original form they are heated to a dark red in the small furnace shown at the right in Fig. 5, the metal becoming soft enough at this temperature so that it can be formed easily. At this point the screen is removed from the furnace and placed on the

form in the press shown at the left.

With the screen in position, the workman opens a valve which admits air into the vertical cylinder, driving the top forming dies down and striking the screen a blow which gives it the correct curvature; a turn of another valve and the flat platens which are attached to the pistons in the horizontal cylinders are projected against the sides of the screen, flattening the sides at the desired angle. The screen is then cooled and given a certain amount of temper by dipping it in cold water. The vertical cylinder of the forming press is 10 in. in diameter and the horizontal cylinders are each of 6 in. diameter.

With the screens cleaned and reshaped and the grease formed into cakes, the next step consists in apply-

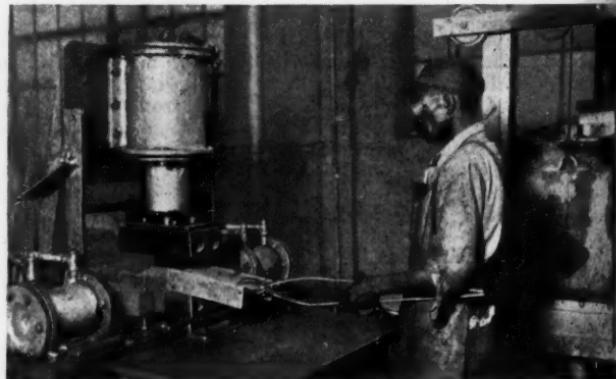


Fig. 5—After cleaning, the screens are heated and reshaped in this air-operated press.

ing the screens to the grease cakes. To do this, a screen is placed in position on a cake and the cakes are

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locked into the box-like frame shown in Fig. 6, this box being hinged at



Fig. 6—Assembling the screen and grease cake in a fixture for the final operation.

one corner and opening at the opposite corner. When the cake is in place, the frame is closed and locked

by means of a strap-bolt.

The frame, with the cake inside, is now placed under the ram of the press shown in Fig. 7. Oil is poured over the screen and water is swabbed on the forming punch, then pressure is applied until the grease begins to come through the holes in the screen. The cake is now ready for use again.

Grease plugs for use in grease cups on side and main rods and crosshead pins are formed to shape in the machine illustrated in Fig. 8. Power is supplied by an air cylinder which is 13½ in. inside diameter and 29½ in. long under the head. The grease is placed in the hopper shown at the center of the machine, from which it is forced out through the die bolts to the front end of the machine. As shown, the machine is forming grease plugs ¾ in. in diameter. As the cylindrical plugs come from the machine they are cut into pieces each 9½ in. long, which is a length that can be

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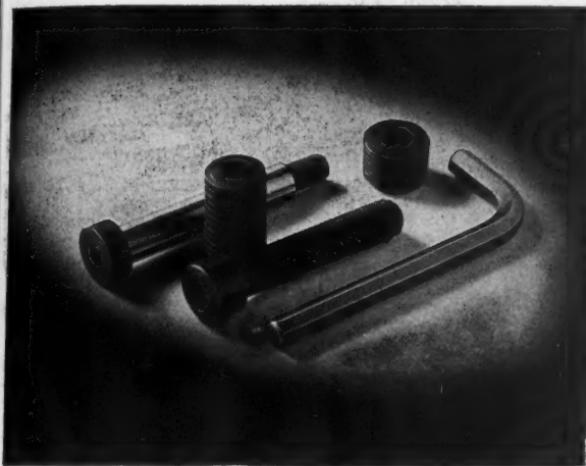
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packed in double rows in boxes for shipment. Plugs of various sizes can be made by changing the dies, which are all of 1-in. boiler plate. The die shown in operation produces 44 grease plugs at a time.

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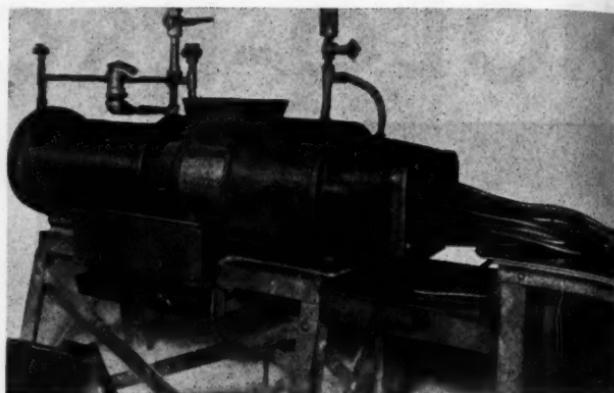


Fig. 8—Using an air-operated machine to form the grease into plugs for use in grease cups on side and main rods.

Economax Hydraulic Radials. Catalog No. 31 now being issued by The Fosdick Machine Tool Co., Cincinnati, Ohio, contains 22 pages of description of the "Economax" Hydraulic Radial Drills made by this firm. Every unit included in the mechanism of these drills is described in detail so that the reader will be able to determine exactly how the machine works and what its possibilities are from the text. Copy free upon request.

Grinding and Finishing with Portable Equipment. Portable grinding and polishing equipment for use in snagging rooms, steel mills, automobile body plants, machine shops, and other places is described and illustrated in detail in a booklet which is now being issued by Norton Company, Worcester, Mass. Copy free upon request.

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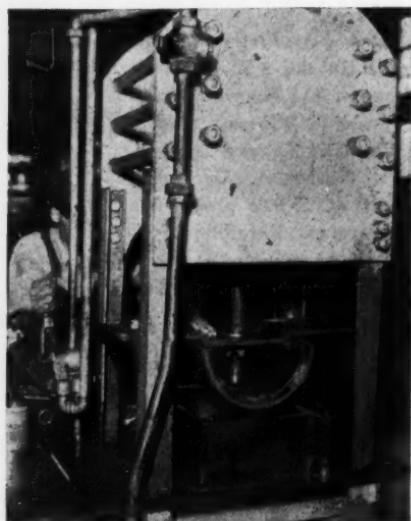
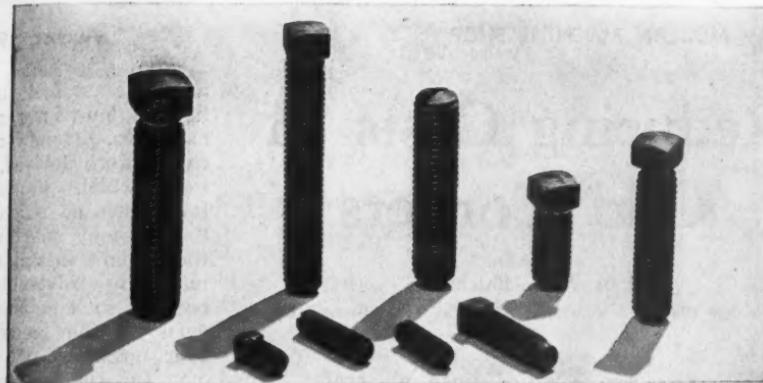


Fig. 7—Pressing the screen and grease cake together.



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Reducing Costs in Odd Corners

By W. K. BAILEY,
Manager Cleveland Territory, The Warner & Swasey Co.

SOME time ago I called upon a superintendent of a large factory, and asked him whether I could look over the plant to see where and how the installation of new machine tools could reduce their production costs. The superintendent was very cordial; he invited me to come in and make any studies I cared to make, but he said that the company did not need any new machine tools.

To bear out his statement, he pointed to a department in which the company operated some six hundred automatic machines of an efficient and fairly modern type. The company has made intensive cost and production studies with respect to this department, and these studies had convinced them that they needed no new machine tools.

New machines, the superintendent explained, would, it was true, produce more pieces per hour, but the department was set up on the basis of one operator to four machines; thus only one-fourth of one man's time per day was chargeable to each machine. Therefore increased productivity of new machines would have to be figured against only one-fourth of one man's time per day. On that basis it would take from seven to eight years for the new machines to pay for themselves on the basis of decreased labor costs, although each new machine would double the production.

Under the circumstances the com-

pany did not feel justified in buying new machines. If new machines were devised, he said, which produced four times as much as the present machines, then a new installation might be advisable—because such machines, even on the basis of four machines per operator, would pay for themselves in about two and a half years, operating sixteen hours per day. But to date no machine tools of such increased productivity had been developed. Therefore, he summed up, they needed no new machine tools.

His conclusion was in my opinion correct, with respect to the department in question.

"But how about your other departments?" I asked him.

"Oh," he said, "they are not so important."

Then I began to investigate.

I found that in the same plant this company had a department operating turret lathes with one operator per machine, where the machines ran two shifts a day for a total of sixteen hours at about the same labor cost per man hour as the department where one operator ran four machines, but at four times the labor cost per machine.

Now, by installing one new turret lathe, one operator would be able to produce as much as two operators had produced previously. The investment would be about \$5,000 and the saving in labor alone would be about \$2,400 per year on a 16-hour per day basis.

Putting it another way; on the so-called unimportant machines, where they were using one operator per machine, replacement of old models by new models would pay for itself in two years, and from then on the labor saving would result in a sub-

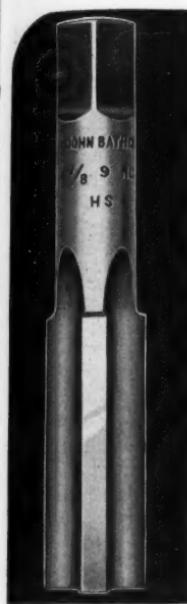
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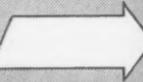
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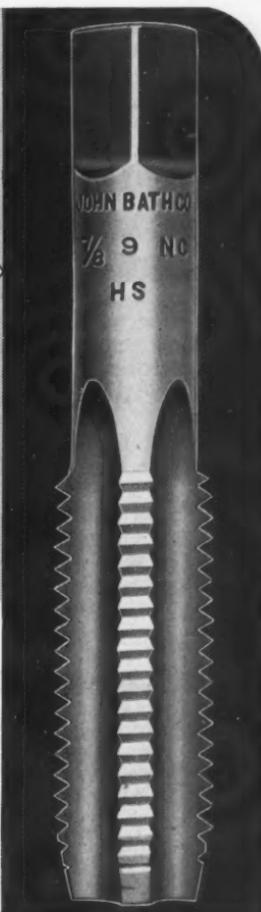


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stantial reduction in production costs.

The situation in this plant is typical of that which obtains in many other plants. In concentrating attention upon larger and more important departments, the shop superintendent or others interested in production costs overlook the savings that can be made in smaller or less important departments.

Throughout industry there seems to be a surprising lack of appreciation of the importance of the so-called unimportant machines in relation to total operating factory costs. The natural tendency is to consider the machines which are high producers, machines running on the same parts day in and day out, or batteries of machines operating on the same class of work, as more important, and to overlook machines operating the same number of hours per day at the same or higher labor costs per hour on parts which are relatively unimportant.

ant with respect to the finished product.

From the standpoint of operating costs, a machine in a tool room operating eight hours a day at eighty cents per hour, but making on the average only two pieces a day, is actually more important than a punch press operating eight hours a day at sixty cents an hour, but making several thousand parts. The point is that if the basis for factory costs is to be labor, the relative importance of machines in any plant should depend directly upon the amount paid for labor on the individual machine, and not upon the production.

In making this statement, I am assuming that in the operation of a plant the total operating cost per day to be charged against the production produced during any given day must be based on the sum total of all the labor paid for in that plant on that day. It is a fact that in many plants

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a substantial share of the savings effected by maximum machine tool efficiency and minimum labor costs in important departments is frittered away by lack of attention to cost-reduction possibilities with respect to minor parts, on pieces considered of secondary importance or other miscellaneous jobs which do not so directly hold the attention of those in charge of production.

That is why it so often happens that when new machine tool possibilities are suggested to a production man, he thinks of them only with respect to the existing equipment which has been installed for the performance of his more important jobs and upon which he has already spent a great deal of thought and effort.

If he would give some thought to new machine tool equipment with respect to his less important jobs, he might find a surprisingly large number of instances in which the installa-

tion of new machine tool equipment would result in substantial reductions in operating costs—reductions which would well justify the immediate purchase of new machine tools.

There is an old axiom "Watch the pennies and the dollars will take care of themselves."

Production men have been watching the dollars, and in so doing have not given enough attention to the pennies.

Landis Thread Cutting Equipment.
Landis Machine Co., Inc., Waynesboro, Pa., is now issuing a booklet describing and illustrating a number of very interesting applications of Landis Threading Machines, Landis Die Heads, and Landis Collapsible Taps. The data included with each illustration gives the name of the plant where the equipment is in use, the particular type and size of equipment used, and includes a description of the job. This information should be invaluable to the machine shop executive in a plant where there is much tapping and threading to be done. Copy free upon request.

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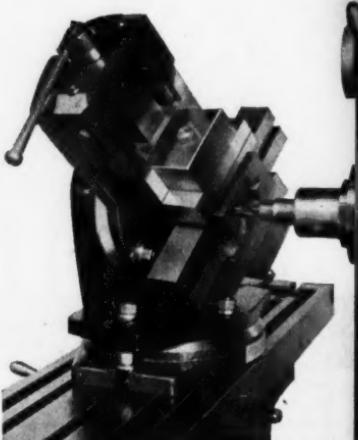
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Simple Attachments Convert Miller into Nibbler

BY MERRILL E. BROWN

WHEN but a few pieces are to be made, the cutting of sheet metal plate without the necessity of expensive dies sometimes presents a problem. However, where a nibbling machine is not available, a simple attachment can be made for a milling machine with which it can satisfactorily be converted into a nibbler. The attachment, which can easily be assembled, is shown in Fig. 1. It consists of four parts; the ram A, guide rails B, crank C, and lower shoe D.

In Fig. 2 the ram, which is to slide up and down on the outside of the large overarm casting on the miller,

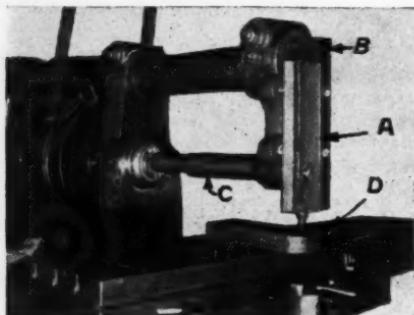


Fig. 1—Milling Machine Equipped with Nibbling Attachment

can be seen. This ram is made from a piece of cold rolled stock $1\frac{1}{2} \times 3\frac{1}{2} \times 12$ in. The longitudinal sides are machined for the conventional 60 deg. dovetail, and oilgrooves are cut on

the sliding surfaces. The lower end of the ram is counterbored to receive the punch. The punch is $\frac{1}{4}$ in. diameter with a $\frac{3}{4}$ in. shank, a $1\frac{1}{16}$ -in. shoulder, and a flat for a set screw. An oval slot 2 in. wide and 1.255 in. high is provided the lower end of the

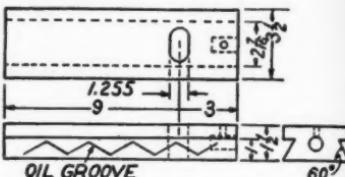


Fig. 2—Drawing of Ram for Nibbling Attachment

ram, as shown in Fig. 2, to receive the crankpin.

The ram as just described reciprocates vertically between two guide rails, illustrated in Fig. 3. These guide rails are $\frac{3}{8} \times 1\frac{1}{8} \times 12$ in. and are made to fit the 60 deg. dovetails in the sides of the ram. The $41/64$ -in. holes for fastening the guide rail to the overarm casting are spaced $2\frac{9}{16}$ in. and $7\frac{1}{2}$ in. respectively from the lower end, and are in the center of each rail. These holes line up with the $\frac{5}{16}$ -in. tapped holes in the overarm casting. There is also a gib on one side which provides for adjustment of the ram in its guide.

The up-and-down movement of the ram between the guide rails is obtained by the action of an eccentric on the end of the crank, shown in Fig. 4. The crank is made from a $1\frac{15}{16}$ -in. boring bar which has a taper on one end to fit the spindle of



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the miller, and is of the proper size to run in the bushing of the overarm casting. The eccentric on the end is

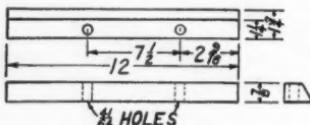


Fig. 3—Drawing of Guide Rail

1.250 in. diameter by 1-5/8 in. long and is located 1/4 in. off center so that its rotary movement in the oval slot propels the ram vertically. Clearance of 0.005 in. on the width and 1/2 in. on the length of the slot allow for adjustment of the rams in the guides.

Figure 5 shows the lower shoe, which is of 1 1/2 x 4 x 11 1/4 in. cold rolled steel, drilled to line up with the T-slots in the table and counterbored to let the 5/8-in. hex nuts sink below the surface. A 5/8-in.

hole drilled approximately 1% in. from the outer end allows the chips to drop out. This shoe is also counterbored for a button die, which is held in place by a 5/16-in. set screw.

The only accuracy required in this set-up is that the ram must fit well in its guides and that the punch must have proper clearance in the die. As the parts are assembled on the machine, the miller table can be moved in any direction to get the proper height and location for the shoe and die.

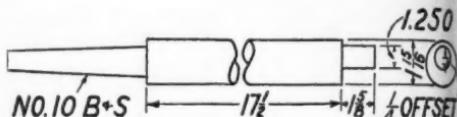


Fig. 4—Crank for Nibbling Attachment

A forked stripper can be used for punching operations, but for nibbling no stripper is necessary. On large

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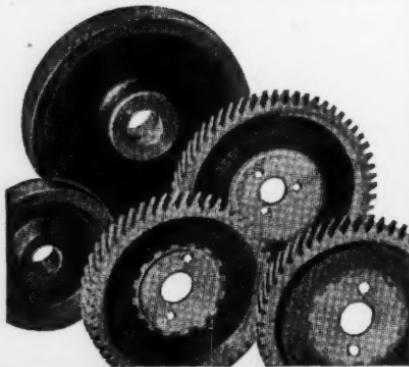
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sections of boiler plate, a 1½-in. wood block can be bolted on either side of the shoe to support the ends of the sheet.

This simple attachment has been

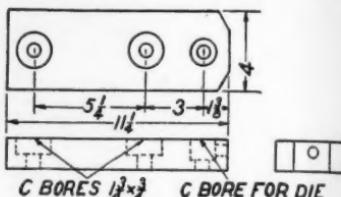


Fig. 5—Shoe in Which the Die is Located

successfully used for punching sheet stock up to 0.062 in., with punches as large as 5/16-in., without causing undue strain on the machine.

Pipe Wrench Attachment For Open End Wrench

BY W. M. HALLIDAY

PIPE can be turned with an ordinary open end wrench when the attachment shown in the illustration is used. The attachment is made of



Pipe Wrench Attachment For Use With Open End Wrench

good quality tool steel, the size depending on the width of the wrench jaw and the size of the pipe to be turned. This piece is machined to the shape of a tapered wedge after

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which a number of teeth, having an inclination towards the thickest end, are cut. On the bottom, a channel of shallow depth is cut of sufficient width to enclose the jaw part of a wrench within the range of sizes upon which the attachment can be used. The attachment is fitted to the wrench as shown in the illustration, and the same procedure as in using the ordinary pipe wrench is followed. The attachment shown in the illustration is designed to cover a range of pipe diameters from $\frac{5}{8}$ to 1 inch.

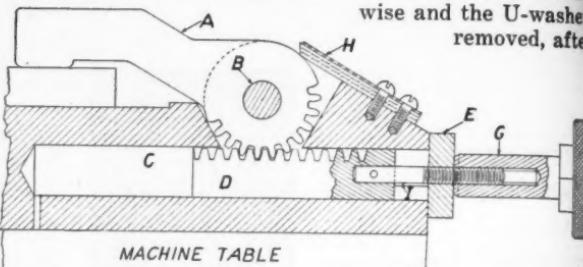
Quick-Acting Fixture Clamp

BY JOHN A. HONEGGER

A QUICK-ACTING fixture clamp, designed for clearance under the milling machine arbor, is shown in the accompanying illustration. The clamp consists of a lockarm made integral with a pinion which meshes with a rack plunger controlled by a knurled nut.

Movement of plunger D outward causes pinion B to revolve and thus bring lockarm A to bear on the work. The stud I is pinned to the rack plunger D and threaded in knurled nut G. With the clamp A in position

on the work, the U-washer E is dropped into position over the stud in the space between the nut G and the face of the fixture. A turn of the nut G applies the extra pressure required for clamping. To unclamp, the knurled nut G is turned counterclockwise and the U-washer removed, after



Drawing of Quick-Acting Fixture Clamp

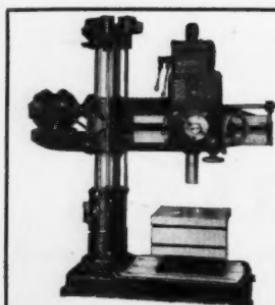
which plunger D is pushed into cavity C and thus the lockarm is raised to a vertical position.

An air release hole is drilled at the end of plunger cavity C so that the rack plunger can freely move backward and forward. A flat, spring backed leather wiper at H prevents injurious material from contacting the working gear teeth.

Drill Press Parallel

BY D. A. ROGERS

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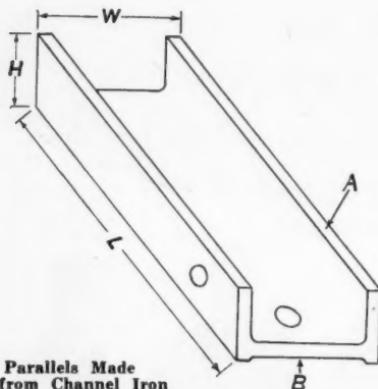
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drilled without drilling the table is usually difficult to keep on hand and in good working order.



A piece of channel iron, as shown in the illustration, when machined on the sides A and B, can be substituted satisfactorily for separate parallel

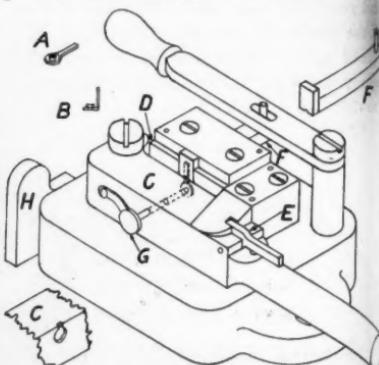
bars. Two holes drilled near one end can be used for hanging or chaining the parallel to the drill press. Although a parallel for small drill presses with length of 12, width of 2, and height of $1\frac{1}{4}$ in., represented by L, W, and H, has been found to be very practical, a larger one of this type can be made which will correspond with the size of the press and the work to be drilled.

To insure long wear, even with rough usage, the parallel may be carbonized and hardened.

Bending a Difficult Small Part

BY CHARLES H. WILLEY

THE design of the electrical instruments made by our firm includes a small formed brass part known as a zero adjuster lever. This part is blanked and formed as shown



at A, then it is required that the tongue be bent at right angles as shown at B. The bending operation presented a problem until the device shown in the illustration was developed.

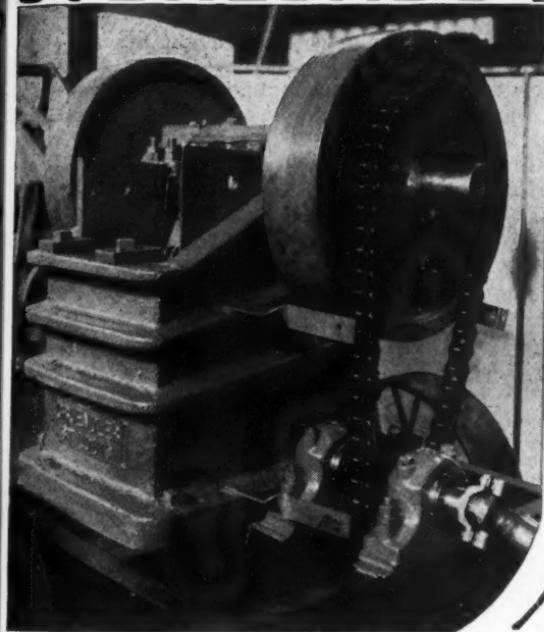
To hold the part A for the bending operation, it is nested in the inside face of the swinging lever C and

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the lever is then closed against block D where it is held by the catch E. Slide F is now pushed inward, bending the tongue of the piece over the top face of the lever C, the tongue being held in alignment by the recess in the bottom face of the slide F.

The work-piece is ejected when the lever C is swung back so that the head of the ejector-pin G strikes against the stop H. The ejector-pin is attached to a stiff spring which holds it out of contact with the work-piece while the operation is in progress.

Improved Work Rest for Rough Grinder

BY W. HALL.

IT is surprising to note how little attention appears to have been given to the provision of more effective and adaptable work rests on rough grinding machines. The ordinary type of work rest, which proves most unsatisfactory for many jobs, is regarded simply as a work-rest and nothing more, with the result that its possible importance in the reduction of labor, power, and time required on certain specified types of work is completely overlooked. The work rest described here is the result of some experimentation in an endeavor to cope with this situation.

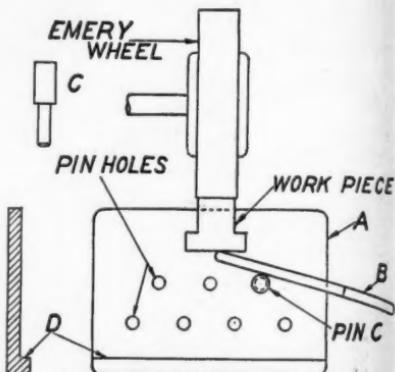
The flat rest table A shown in the illustration is provided with a substantial step D on the side nearest the operator. This step has been found to be extremely useful in the grinding of long work, in which case one end is rested against step D or against inserted blocking pieces placed so as to bring the work nearer the wheel.

A number of circular holes of the same diameter as the small end of Pin C were drilled through table A.

Pins such as C, to be used as fulcrums, are of ample dimensions relative to the weight of the workpieces to be dealt with, due to the fact that a pin too small might bend or shear.

A long rod lever as at B, knurled at one end to secure a better hand grip, can be used to obtain pressure of the work against the emery wheel.

The table A is simply bolted to the



Design of Improved Work Rest for Rough Grinding

ordinary work rest, care being taken to insure an absolutely rigid and safe installation. Holes which can later be tapped are drilled in the table, and clearance holes are drilled in the work rest. This makes it possible for screws to be inserted from the bottom side of the table, thus eliminating interference with screw heads on the face of the machine.

When the auxiliary table is not required, it can easily be removed.

Racine High Speed Metal Cutting Machines. Racine "Oil Cut" Hydraulic Metal Cutting Machines are fully described in a new loose leaf catalog which is now being issued by Racine Tool & Machine Company, 1760 State St., Racine, Wis. The catalog includes descriptions of the various types and sizes of metal cutting machines made by this firm, including the Racine Duplex Band Saw. Copy free upon request.

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Over the Editor's Desk

Are Manufacturers "Gyping" Themselves?

WITH business conditions improving steadily, it is daily becoming more evident that industry will soon be faced with a shortage of skilled labor. More than a year ago the skilled labor problem in the automobile industry became so serious that the manufacturers of Detroit inaugurated an apprentice training program, and now the United Air Lines has announced a course of training for the purpose of insuring an adequate supply of trained mechanics for the aircraft industries.

Artisans skilled in the use of modern tools and instruments are a necessity to industry. Without them and their ability to build intricate dies and fixtures and their ability to operate modern production machines there would be no industry as we know it today. But such men are not cheap, and the more such men a manufacturer has on his payroll, the more it behooves him to make sure that he is getting what he is paying for.

A highly-skilled mechanic is hired for his ability to make the best use of intricate machines and sensitive instruments in the production of high grade work, and he is paid accordingly. To use the time of such a mechanic for trucking parts, or for cleaning machines, or for making machine repairs would be a sheer waste of payroll money, ability, and equipment investment—for while the mechanic is wasting his time on such details, his machine is standing idle.

A recording device attached to a high priced jig-boring machine in a toolroom showed that the machine was actually operating only one and one-half hours per day. Granted that time must be allowed for setting

up the job and making tool adjustments, still the machine should be in operation a larger percentage of the time than the record indicated. Unless the manufacturer can keep his high-priced men and his high-priced machines producing, he is cheating himself.

Periodical surveys should be made in every plant to make sure that all the production possible is being obtained with the mechanics available. In many cases this suggestion will apply more to the toolrooms than to the production departments, where methods engineers are usually on the job. And it is true that in many cases where a close watch is maintained on the production departments, no effort is made to increase production in the tool department through relieving the high priced mechanics of common-labor tasks.

In both production and tool departments all machine repairs should be made by repairmen. No skilled mechanic should have to oil or clean a machine; this can be done by non-productive labor. The foregoing applies particularly in toolrooms, where it has always been considered good shop breeding to clean a machine when one is through using it. A dollar an hour for cleaning machines is waste.

Productive time can be increased by the use of duplicate tools, duplicate arbors and dogs, and other equipment. It should not be necessary for a mechanic to leave his machine to exchange or grind tools, nor should the machine be allowed to "cut air" while the arbor is being changed from one work-piece to another.

An adequate supply of work should be ready at the machine at all times. Conveyors should be installed wherever possible to bring the work and take it away. Judicious and intelligent use of chutes and conveyors will save much time of both productive and non-productive workmen, as well as machine time.

New Shop Equipment

Gisholt No. 3, 4 and 5 Ram Type Universal Turret Lathes

The Gisholt Machine Co., 1217 E. Washington Ave., Madison, Wis., has brought out a series of ram type universal turret lathes which are said to be highly efficient both on production work and on small lot operation. Automatic time-saving devices which are built into

design is mechanically simple and absolutely reliable.

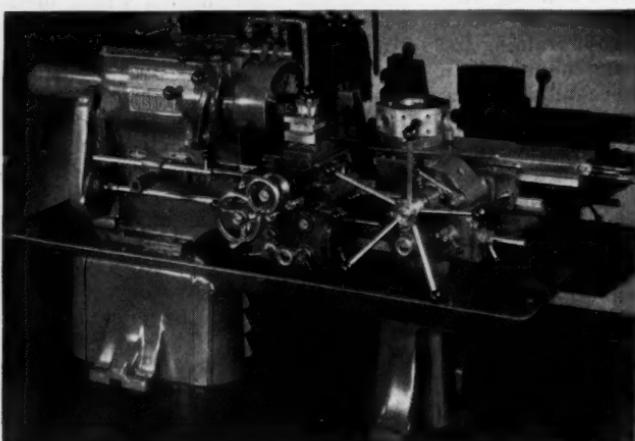
The spindle and all headstock shafts are mounted on precision type anti-friction tapered roller bearings. The gears in the headstock are of chrome nickel steel, hardened and ground. The high speed gears are of the helical type. A roller chain provides for reversing the spindle.

Shifting from forward to reverse is controlled through a single lever. Shifting the lever to neutral position automatically applies a brake to stop the spindle. A safety latch in the neutral position prevents accidental starting.

The bed and headstock are made in one piece and are cast from nickel semi-steel. Extra depth and width of the bed provides for maximum stability. The bed is composed of three heavily walled box sections reinforced with heavy "X" internal

side ribs and large internal fillets, thus offering the maximum resistance to distortion. The carriage rides on full length hardened steel plates which are securely anchored to the bed ways and then ground in perfect alignment with the spindle. Wear is practically eliminated and permanent accuracy assured.

The No. 3, 4 and 5 lathes are identical in design and construction, differing only in size and capacity. They cover 1½ in. to 2½ in. bar capacity and 8 in. to 15 in. chucking capacity. Standard attachments, which are available for all three machines, include thread chasing attachments for the cross slide and hexagon ram slide, selective gear jaws for use in connection with the thread chasing attachment, taper attachment, bar feed



Gisholt Ram Type Universal Turret Lathe

the machines as standard equipment are said to make the machines easy to operate and fast in operation.

In addition to the automatic indexing of the hexagon turret and its stop roll, the turret is automatically located and clamped in place as the ram slide goes forward to the work. This whole operation is accomplished without the operator taking his hand from the pilot wheel.

The quick indexing square turret on the cross slide is arranged to hold four tools. Here again a single lever movement accomplishes the indexing, locating and clamping. A forward and back movement of the lever is all that is required to index the tool post. The selective gear transmission permits changes in the spindle speeds without passing through intermediate speeds. The whole

attachment and collet chuck, and a complete line of three-jaw universal chucks.

Pratt & Whitney High Speed No. 12B Vertical Miller and Profiler

Pratt & Whitney Division, Niles-Bement-Pond Company, Hartford, Conn., announces a High Speed Vertical Miller and Profiler to be known as the No. 12B. The machine is available with either one or two spindles, and can be supplied either as a single purpose machine or as a general purpose machine, according to the work to be done and the spindle speeds desired. As illustrated, the machine is similar in general appearance to previous Pratt & Whitney Profilers in that the spindles travel longitudinally on a cross slide while the table travels transversely between the two columns.

Each spindle has its own driving motor, which is mounted vertically on a hinged bracket at the rear of a machine and drives the spindle through multiple V-belts. Belt tension is maintained by a radius rod and turnbuckle for each motor. When supplied as a general purpose machine, the spindles are driven individually by four-speed motors, with motor and spindle pulleys interchangeable, making available eight spindle speeds of 300, 450, 600, 900, 1200, 1800, 2400 and 3600 r.p.m.

As a single purpose machine, constant speed individual motors are used with step pulleys, providing four spindle speeds. According to the motor speed specified the spindle speeds are as follows:

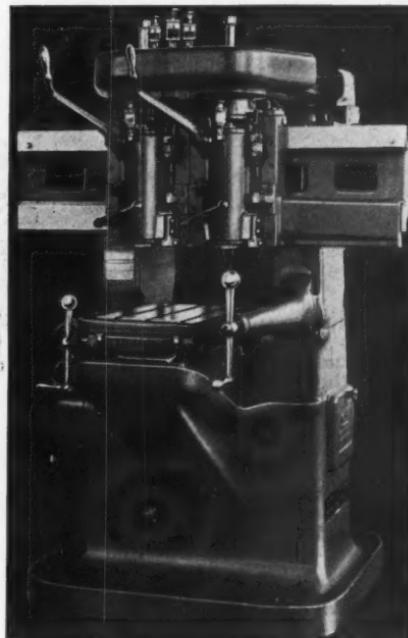
600 r.p.m. motor—spindle speeds
300 to 1200 r.p.m.
900 r.p.m. motor—spindle speeds
450 to 1800 r.p.m.
1200 r.p.m. motor—spindle speeds
600 to 2400 r.p.m.
1800 r.p.m. motor—spindle speeds
900 to 3600 r.p.m.

In either case the spindle driving motors are 1 h.p., 50 or 60 cycle a.c. The drive pulleys are mounted on ball bearings which are lubricated by two sight oilers on top of the head. A third and larger sight oiler lubricates all the slides in the head and cross rail.

The spindles are mounted in slides and have a vertical travel of $4\frac{1}{2}$ in. The minimum distance from the table-top to the spindle-end is $3\frac{1}{2}$ in. and the maximum distance, 8 in. Each spindle is mounted in two preloaded super-precision ball bearings at the bottom and a single floating ball bearing at the top.

Cutters are held in the spindle nose by a drawbar, which also functions as a positive knockout for cutters.

The spindle slides are traversed vertically by large levers convenient to the operator. Positive, vertical, adjustable stops are provided, each having a dial



Pratt & Whitney High Speed No. 12B Vertical Miller and Profiler

graduated in thousandths. A horizontal lever in front of each spindle locks the spindle slide in any desired position. One former pin block is provided on the left spindle, and two on the right spindle.

The table rides on one truncated V and one flat way and is strapped in place. Both the table and cross slide are operated by suitable levers through a rack and pinion drive, mounted on ball bearings. Individual motor controls are provided for the four speed motors, the push buttons being mounted on the left hand column.

The table working surface measures 14 x 18 in. and the table travel is 20 in. There is an 8-in. clearance between the table top and the bottom of the cross

slide. The cross slide transverse movement is $22\frac{1}{2}$ in. for the two-spindle machine and $27\frac{1}{2}$ in. for the single spindle machine. The distance between the two spindles is 12 in. and the distance between the spindle and the guide pin is $4\frac{1}{8}$ in. The total distance between the uprights is 20 in. No. 9 B&S taper holes are provided in the spindles. The approximate net weight of the single spindle machine is 3900 lbs., and of the two-spindle machine is 4460 lbs. Both machines occupy a floor space of $68 \times 70\frac{1}{2}$ in. and are $78\frac{1}{2}$ in. high.

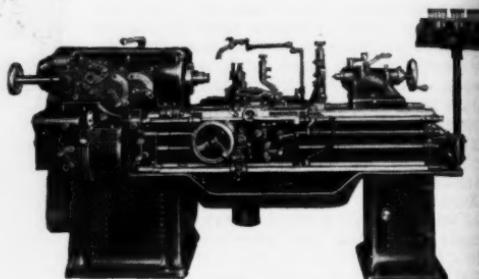
Sidney Precision Tool Room Lathe

A precision tool room lathe made in 14, 16 and 20-in. sizes has been placed on the market by The Sidney Machine Tool Co., 210 Highland Ave., Sidney, Ohio. The feature of the lathe consists in that the 16 selectable spindle speed changes are made through engagement of sliding spur tooth gears, without the employment of clutches. The gears are of alloy steel forgings, heat treated and ground, with teeth lapped under working pressure. The shafts in the headstock are of alloy steel forgings, accurately turned and ground and fitted with multiple integral solid splines. Headstock lubrication is automatic through filtered oil provided by a pump and spray system with individual copper oil lines feeding all important bearings.

All shafts in the headstock operate on Timken precision taper roller bearings, except that the main spindle is mounted on one-piece tapered 80-10-10 phosphor bronze bearing as standard equipment. Timken precision O type bearings can be furnished on the main spindle. Spin-

dle bearings are adjustable from outside of the headstock cover.

The lathe bed is a well-seasoned casting of 50 per cent steel and 1 per cent nickel content throughout, presenting close-grained texture with hard-wearing surfaces for the carriage. Bed ways test not less than 200 Brinell. The bed is of the three V type, with double-walled cross girts providing extra rigidity to the carriage. The lathe bed on the 20-in. size is provided with double side walls



Sidney Precision Tool Room Lathe

under both front and rear ways and with double-walled cross girts.

The quick change gear box is a separate unit, tongued, grooved and bolted to the front of the bed. All gears are of alloy steel forgings, accurately machine cut, heat treated and ground. All shafts operate on anti-friction bearings. Forty-eight thread and feed changes are available without the use of extra gears.

The carriage is provided with long bearings on the bed, without relief under the carriage bridge. Two angular and one wide flat bearing are provided on the bed ways. The apron is of double plate construction with front and rear bearings for all shafts and studs. Apron



QUICK-LOADING STOCK REELS

SINGLE AND DOUBLE

For use with automatic machines and punch presses with feeds. Also reels for wire.

S & S MACHINE WORKS

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CUT
ANY METAL
FROM THE TOUGHEST
HIGH CHROME, HIGH
CARBON STEEL TO
ALUMINUM. HERE IS
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FROM 75 TO 450
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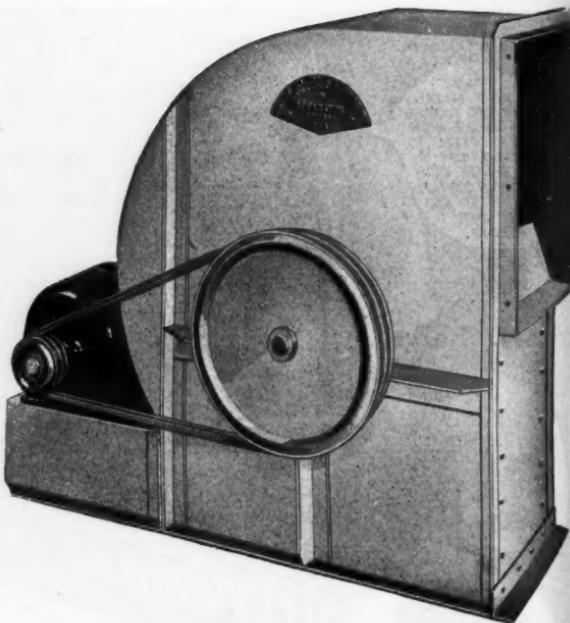
A TYPICAL JOB
SAWING TIME
45 MINUTES
FILING TIME
30 MINUTES

**TAKES
THE JOB
RIGHT THRU**

CONTINENTAL MACHINE SPECIALTIES INC. MINNEAPOLIS, MINN.

gears are of alloy steel, heat treated and ground. All shafts in the apron operate on anti-friction bearings. Centralized lubrication is provided for apron stud bearings. Carriage bed ways and compound slide are automatically oiled by a built-in oiling mechanism.

The top slide of the compound rest has no overhang when fully extended. The swivel is graduated in degrees on both sides. Large micrometer graduated dials are provided on the cross feed and compound rest screws. The tailstock is of heavy duty design with a full bearing on the bed, and is provided with a single lever clamping device. The weights of the three different sizes of this lathe are, respectively, 3900, 4400, and 5600 pounds.



Autovent V Belt Drive Unit Blower

Autovent V Belt Drive Unit Blower

The illustration shows the Autovent V Belt Drive Unit Blower which has been developed by Autovent Fan & Blower Company, 1819 N. Kostner Ave., Chicago, Ill. This blower has been developed to meet a specific need for a combined unit for installations where, on account of local conditions, a V belt drive unit is considered more desirable than a direct connected blower.

The Autovent Blower arrangement involves the Uniblade Type H Blower op-

erated by a standard frame motor equipped with a suitable V belt drive. The motor is mounted on a steel pedestal base, built integral with the blower housing, making a compact unit which is easy to install and which insures flexibility of control. This is essential on certain applications where at times it is necessary to increase or decrease the air delivery.

The blower is made in five sizes; the No. 2, with a 12½-in. wheel; No. 2½, with a 15½-in. wheel; No. 3, with

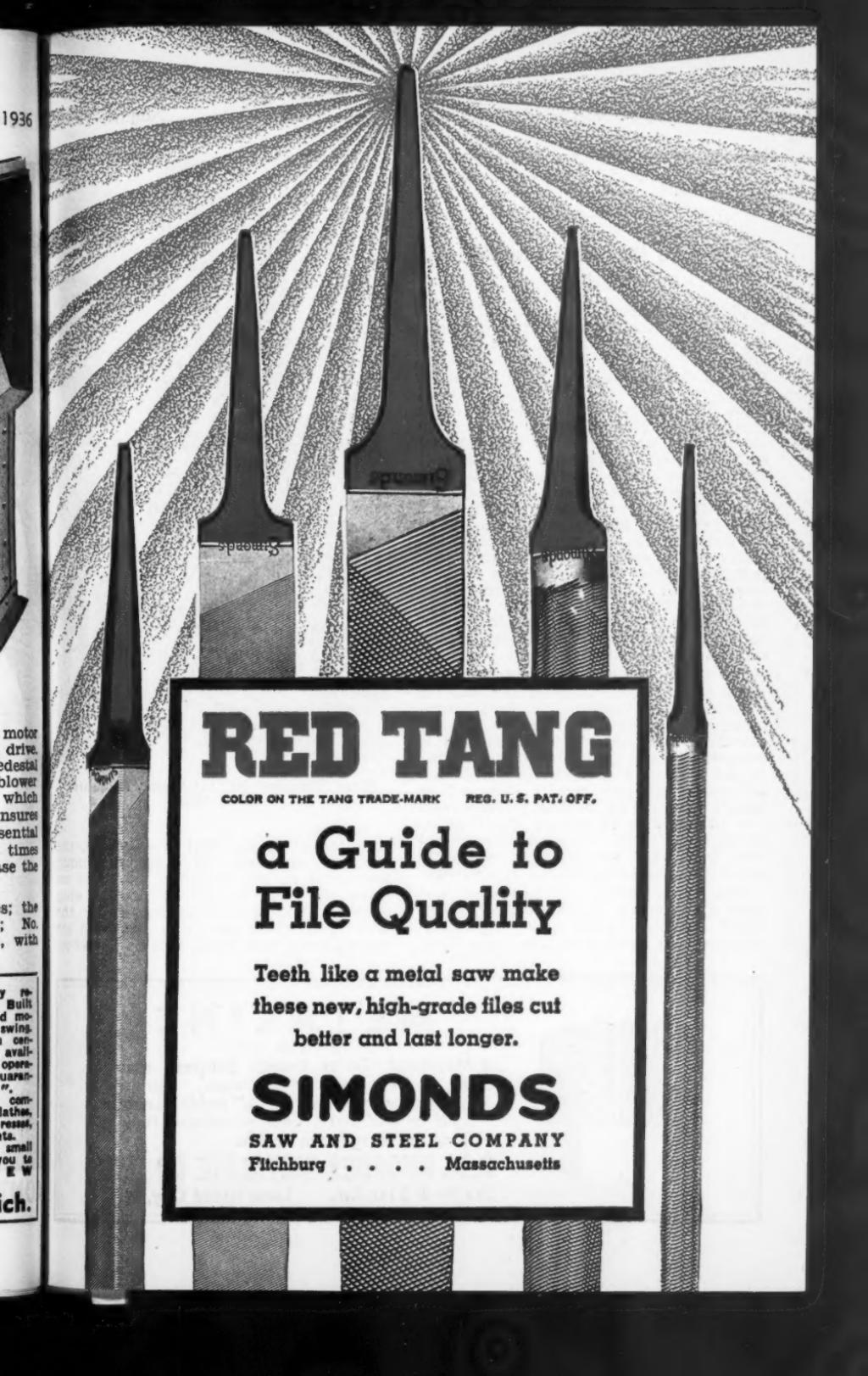
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METAL WORKING
LATHES**



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better and last longer.

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SAW AND STEEL COMPANY
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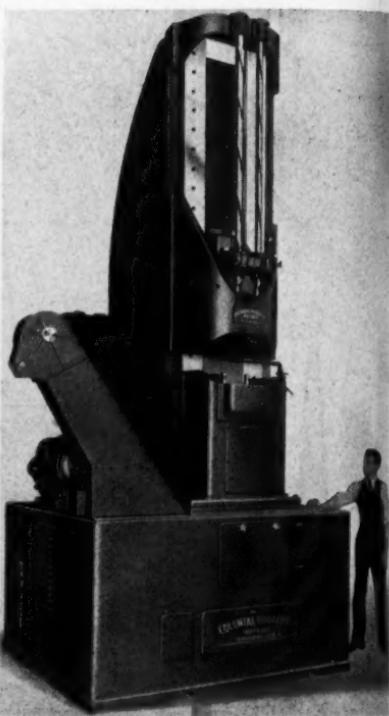
a 18 $\frac{3}{4}$ -in. wheel; No. 3 $\frac{1}{2}$, with a 21 $\frac{1}{8}$ -in. wheel, and the No. 4, with a 25-in. wheel.

Colonial "Largest" Broaching Machine

Illustrated herewith is what is believed to be the largest vertical broaching machine in use today, built for the Buick Motor Company by Colonial Broach Co., 147 Jos. Campau Ave., Detroit, Mich. The great height of the machine—16 ft. from base to top—made it necessary to sink the machine into a pit 4 ft. deep so that the work could be handled and ceiling clearance provided. The size of the gear to be broached and amount of stock to be removed made necessary provision for 30 tons pressure in the ram. This unusually high power was achieved by coupling 40 and 20 h.p. motors directly to a combination of hydraulic pumps capable of producing a cutting speed of 30 ft. per minute with this pressure. The ram itself has a stroke of 5 ft. and, to obtain the production required, two gears are broached side by side on the machine.

The design of the machine follows the usual principle of Colonial design. In operation the machine is fully automatic. Broaches are handled by hydraulic cylinders, and the spiral feed is produced by the spiral driving bars, connected through a gear box to the broach pulleys. The gear box is designed to enable disengaging of the pulleys from the driving bars by means of a conventional hand lever. It is possible, therefore, to change the machine over from spiral to straight broaching if desirable.

The ram travels on hardened and ground spindles, automatically lubricated. Coolant is fed under high pressure to both above and below the work.



Giant Machine for Internally Broaching Spiral Gears

Running at 85 per cent of capacity, the machine broaches 180 gears per hour. Inasmuch as the machine produces an unusually large volume of chips, a chip conveyor has been provided under the floor onto which the chips drop and are carried away to a point outside the shop.

New Y
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Wessell
W-560



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5th St. & 51st Ave. Long Island City, N. Y.

1936

Second Wheel

Just a few typical comments—picked at random from trial reports.

NORTON COMPANY, WORCESTER, MASS.

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W-560

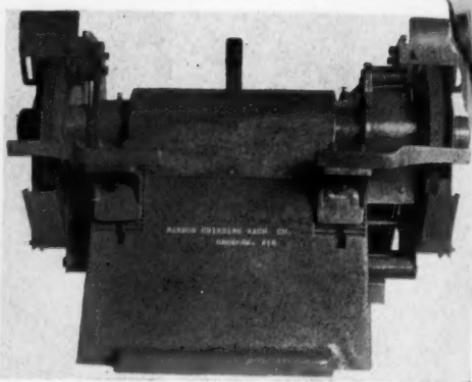


Grinding Wheels, Pulpstones, Laboratory Ware; Refractories; Porous Plates; Absorbent Papers and Cloths. Oilstones and Sharpening Specialties.

Ransom High Speed Grinder

Grinding machines designed for use with 24-in. and 30-in. high speed wheels, for foundry grinding, have been developed by Ransom Grinding Machine Co., Oshkosh, Wis. Four changes of speed are available by changing the sheaves on the motor.

Power is supplied by a 15 h.p. motor which is rigidly bolted to the back of the machine. The drive from the motor to the spindle is by means of texropes which run from a sheave of unusual diameter on a spindle. This sheave is placed outside of the right hand end bearing and is so arranged that new texropes can be installed without disturbing the motor. The installation is accomplished by removing one of the emery wheels and slipping the texropes over the arbor. The speed is controlled so that it is impossible to overspeed the wheels and the arrangement is such that it is immediately apparent from the front of the machine when the next larger size sheave should be put on to speed up the wheels. The weight of the 24-in. machine is 3850 lbs. and the

**Ransom High Speed Grinder**

30-in. machine is 3900 pounds.

"Production" Motorized Countershaft

The illustration shows an installation of the motorized countershaft now being made by The Production Equipment

DRESES

RADIAL DRILLS

Provide

- **POWER**
- **SPEED**
- **ACCURACY**
- **LOW COST**

It's a paying investment to modernize your plant now with a DRESES RADIAL DRILL.

Write today for full information on these advanced tools.

THE DRESES MACHINE TOOL CO.

CINCINNATI, OHIO

OVERHEAD MATERIALS HANDLING

SINGLE LEG GANTRY CRANES on the Assembly Floor

- This application of Cleveland Tramrail was developed out of the "demands" of a manufacturer for equipment to use in assembling machine tools, the idea being to give EACH OPERATOR a tool for handling and placing of heavy parts. This releases the overhead Crane for the heavy lifts exclusively and discontinues "time out" of assembly men waiting for a lift.



- This is the first installation of a Cleveland Tramrail Single Leg Gantry Crane. Many other applications have since been made of this type of equipment.

Consult your phone directory under Cleveland Tramrail

CLEVELAND



TRAMRAIL

DIVISION OF

THE CLEVELAND CRANE & ENGINEERING CO.

WICKLIFFE, OHIO



ELAPSED TIME

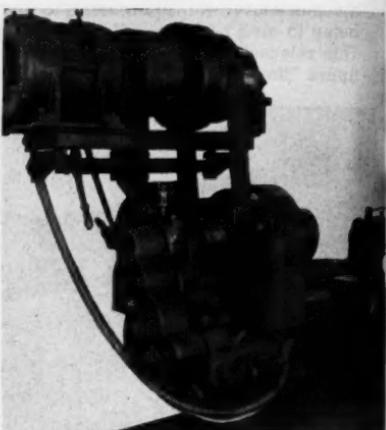
• The Calculagraph automatically records it for all jobs with non-working periods deducted . . . A durable, precision time recorder either spring or motor drive . . . Adapted to any system of time recording . . . A Calculagraph eliminates computing of time and insures accuracy.

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"ELAPSED TIME RECORDS"

CALCULAGRAPH CO.

52 Church Street, New York, N. Y.

Co., 5219 Chester Ave., Cleveland, Ohio. This motorized countershaft is the Type 844, which was developed for the motorization of cone pulley machines, such as the lathe shown in the illustration. The Type 844 countershaft uses a two-speed constant horsepower motor with a 3:1 speed ratio to develop full capacity of the lathe at maximum cutting speeds. The motor speeds are controlled by a multi-speed drum conveniently located to the operator. Motorizing a machine



"Production" Type 844 Motorized Countershaft

in this manner makes it independent of line shaft operation.

The Type 844 drive consists of a three bearing gear motor with extended shaft for mounting the countershaft cone pulley, with a heavy duty anti-friction outboard bearing, all supported on a rigid one-piece base. This base is hinged to the mounting column with rigid arms supporting both ends, thus maintaining accurate alignment under all operating conditions. Cams attached to the arms provide means of raising or lowering the base for shifting of the belt. The drive is quickly installed and delivers full power to the machine spindle without chatter or vibration.

Seneca Falls Automatic Safety Work Handling Device

The illustration shows a Low-Swing "Imp" Automatic Lathe, made by Seneca Falls Machine Co., Seneca Falls, N. Y., equipped with an automatic safety work

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THEY TAKE
YOUR ORDER
BY PHONE

THEY FILL YOUR ORDER QUICKLY
FROM CLASSIFIED STOCKS

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Efficient
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- It is usually but a few hours from the time you phone a local distributor for Union Cold Drawn Steels until the stock arrives at your plant.

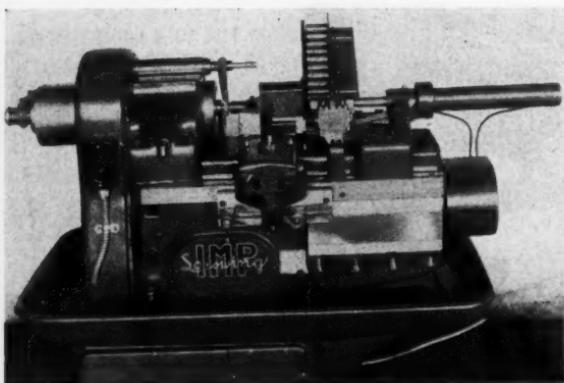
Efficiency in delivery service is as vital to you as the efficiency of the steel used in your operations. Your orders must be filled promptly and correctly. Union Drawn Distributors give that kind of performance. It is their chief asset—the reason behind their growing sales.

Over a hundred distributors carry Union Cold Drawn Steels because of their higher quality. One of them is near you, ready to serve any hour of the day with accurate, straight, bright finished and free machining bars in standard shapes and sizes, cut to required lengths.



QUALITY
EFFICIENCY
WITH

Union Cold Drawn Steels



Low-Swing "Imp" Automatic Lathe Equipped with Automatic Safety Work Holding Device

holding device made by the same firm. The machine as shown is in operation on a bronze bushing job. In operation the work chute is kept filled by the operator and work is fed automatically to the work holding arbor for machining. After the work has been machined, the tool withdraws and automatically

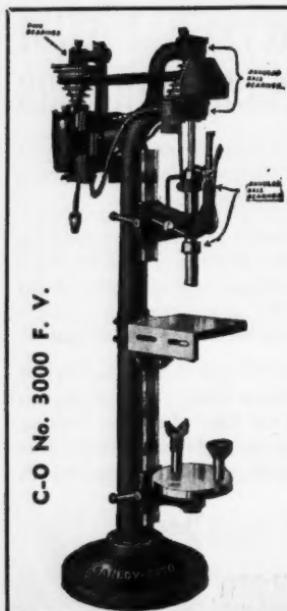
returns to the starting point, while simultaneously the finished work is stripped from the mandrel and discharge into a finished work chute as the next piece is loaded into the arbor.

The installation shown has increased the production on this operation and reduced direct labor cost 75 per cent. The operation of the machine does not depend upon a skilled mechanic.

Not the least important factor, according to the manufacturers, is the reduction in accident hazard.

Model 400 Flexopress

The illustration shows the Flexopress which has been brought out by Flex Machines, 2228 N. Racine Ave., Chicago Ill. The machine is designed to perform three distinct functions, the first of which is cutting production materials



CANEDY-OTTO

SLIDING HEAD SENSITIVE DRILL WITH FULL BALL-BEARING SPINDLE

This CANEDY-OTTO Drill is built to give the greatest degree of speed and accuracy in drilling holes up to $\frac{1}{8}$ " in diam. Annular ball bearings in the spindle, two ball bearings on the spindle cone pulley, and self-aligning ball bearings on the motor bracket assure precision drilling and unusually long life. Motor bracket is of the hinge type for quick change of the belt from one speed to another. High grade motor drives spindle thru heavy endless V-Belt . . . proper belt tension easily obtained . . . wide range of spindle speeds provided by six-step sheave type pulleys. You will profit by fully investigating this sensitive, easily operated C-O floor drill which is furnished in any voltage, cycles or phase . . . completely equipped. CANEDY-OTTO Drills are always "READY FOR THE JOB".

Write today for Bulletin C-O No. 3000 F. V.

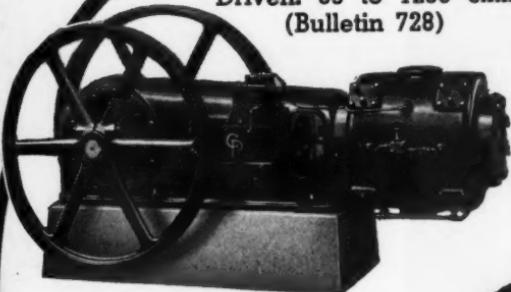
CANEDY-OTTO MANUFACTURING CO.
CHICAGO HEIGHTS

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AIR COMPRESSORS

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Type T Single-Stage, Belt-
Driven. 89 to 1293 c.f.m.
(Bulletin 728)

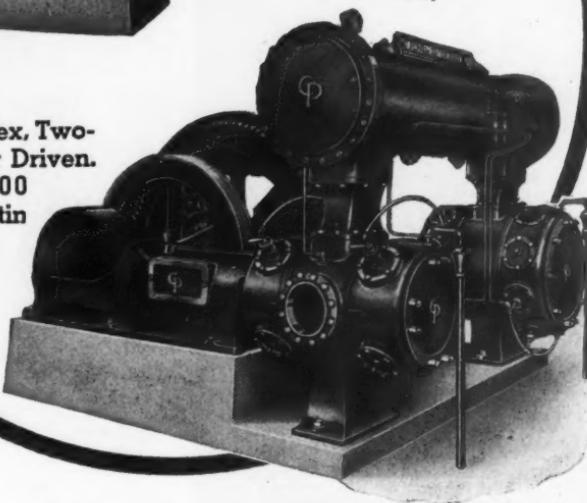


(Above)

Type P Two-
Stage, AIR-
Cooled. 85 to 382
c.f.m. (Bulletin
759)

(Right)

Type O Duplex, Two-
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A size, type and drive to meet every requirement.

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1/4 TO 6 TONS CAPACITY



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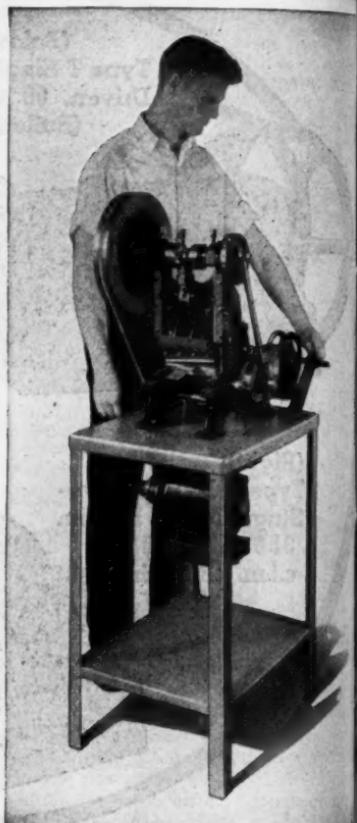
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CRANE & HOIST CORP.

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uniform lengths up to 9 in. It can handle wire, light metal and other materials accurately and at high speed. The second application is the high speed production of very small light stamped parts, such as clips, connectors, space washers, and hundreds of others. The



Model 400 Flexopress

dies are usually very simple and comparatively economical. The third application is the high speed continuous perforating of light metal, paper, cloth, film, and so on.

An interesting feature of the machine is the automatic built-in feed. A positive locking device insures permanence of setting and the feed has an adjustable automatic release to permit alignment of stock when progressive dies are used. Inasmuch as the operation of the machine is automatic, it requires little

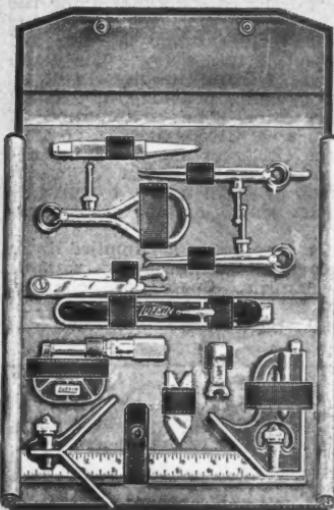
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These Sets contain only those tools that are indispensable to the student or beginner, and are identically the same as those sold to fine mechanics for their regular work. Thus these Precision Tools may well become a part of the more complete kit or chest of tools which the mechanic will require in his work to follow.

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A sturdy, fine appearing, Quality Tool Chest made of quarter-sawed oak, handsomely finished. Heavy nickel-plated fittings.

Made in one size only—to accommodate an 18" blade.

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THE LUFKIN RULE CO.
SAGINAW, MICHIGAN, U. S. A.

Canadian Factory
WINDSOR, ONT.

tention and one operator can easily handle a battery of several machines.

The Flexopress is furnished complete with stand, $\frac{1}{4}$ h.p. motor with four speed drive, giving a range of speed of from 6000 to 18,000 strokes per hour.

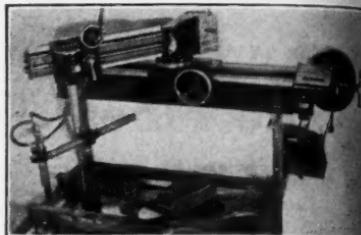
Schoitz Flame Cutting Machine

A machine which makes it possible to control a flame cutting torch in the same manner as a metal cutting tool has been developed by Schoitz Tool, Gear & Machine Works, Waterloo, Iowa. The machine is designed somewhat along the lines of a machine tool, the torch being carried in a holder which is controlled by means of a lead screw. The torch can be fed by hand in any direction, the controls being conveniently located for the operator. The combination of arms, ways and drive makes it possible to cut true circles or shapes of any design directly from a layout. The cut can be made at right angles to the surface of the work, or at any desired angle.

Power for the feeds is supplied by a $\frac{1}{2}$ h.p. geared motor through a variable speed mechanism. Speeds are changed by means of a speed selector control wheel and the reverse movement is

controlled through a reverse switch.

Longitudinal cutting range is 38 in. and the cross travel or angular cutting range is 17 in. Circles of any diameter from $3\frac{1}{2}$ to 36 in. can be cut, and work



Schoitz Flame Cutting Machine

can range in thickness from $\frac{1}{4}$ in. to 6 in. The cutting speed is infinitely variable between 2 in. and 30 in. per minute. A chart supplied with the machine provides necessary data on gas pressures, tip size and speeds for straight or circular movement. Floor space required, 5x7 ft. Shipping weight of the machine is 900 pounds.



Not just another grinder—A PRECISION TOOL, RIGID, POWERFUL, PRACTICAL AND EFFICIENT.

Motor—Constant speed heavy duty ball bearing, no metal contact between motor and saddle.

WHEEL SPINDLE—equipped with precision ball bearings, automatically adjusted, regardless of heat or wear, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$ H. P.—\$65.00 to \$97.50.

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E-Z SET BORING TOOL

C O M P A C T, RIGID. Small body, large boring capacity. Adjustment actuated by a worm. Straight or taper shank. Adaptable to Jig and Fixture. Production or Maintenance work.

Made in 3 Sizes
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WILLIAMS' "Agrippa" Tool Holders enable you to get out of your lathes everything in the way of performance that the designer built into them. Holders for every regular operation on lathe, planer and shaper. All insure fast, chatter-proof, clean-cutting service. Ask your distributor about "The Holders that Hold." He'll know you mean "Agrippas."

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R. H. Offset
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Cutting-off
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Threading-Tool
with Formed
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Boring-Tool
with Sleeve
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Headquarters for: Drop-Forged Wrenches (Carbon and Alloy), Detachable Socket Wrenches, "C" Clamps, Lathe Dogs, Tool Holders, Eye Bolts, Hoist Hooks, Thumb Nuts and Screws, Chain Pipe Tongs and Vises, etc.

Western Warehouse, Sales Office, Chicago—Works, Buffalo, N. Y.



Sutton Fingers and Collets Work Together

To give you greater uniformity in screw machine production and to prolong the life of the chucking mechanism.

These advantages come from Sutton exclusive design features: Diamond Serrations in all types of collets; pads in master-type collets that adjust themselves to hot-rolled stock; pads held securely in master fingers without pins or screws. Details of all features in Sutton No. 12 Catalog, the complete manual of screw machine accessories. Send for a copy.

SUTTON TOOL COMPANY
2838 W. Grand Blvd., Detroit, Mich.



Conco Spur-Geared Hand-Chain Hoists

The Conco Engineering Works, 844 Jefferson Street, Mendota, Illinois, is introducing an improved, reasonably-priced, spur-geared hand-chain hoist in which precision ball bearings, accurate machining of parts and other features



Conco Spur-Geared Hand Chain Hoist

combine to lessen the energy required to move a given load in a given time. This type is used for material handling in most industries, in capacities from $\frac{1}{4}$ ton to 6 tons, although other Conco Spur-Geared Hand-Chain Hoists of similar design are available up to 20 ton capacity.

The makers lay particular emphasis on the importance of precision-ground bearings to minimize friction, including the

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*You-
made it grow*

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YOUR SUPPORT HAS BEEN APPRECIATED.

★ the readers of MODERN MACHINE SHOP

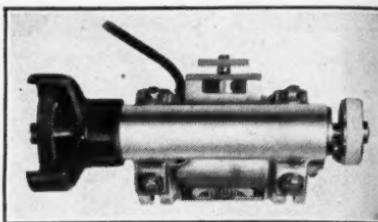
inner and outer races as well as the bearing rollers. Hoists of 3 ton capacity and up are of the double-line type and these have precision ball bearings on the idle sheave axles.

To lift its rated load capacity one foot, the 1½ ton hoist requires a chain overhaul of 35 ft. and a chain pull of 100 lbs.; the 3 ton hoist, 70 ft. chain overhaul and 101 lb. chain pull; the 6 ton hoist, 133.5 ft. chain overhaul and 117 lb. chain pull. The performance is hailed as especially noteworthy in view of the fact that each hoist in this line is tested to 150 per cent of its rated capacity.

Special effort has been made to make the hoist foolproof. A safety load-chain guide is provided as "jam insurance". It keeps the chain from riding out of the pocket or fouling, or leaving the wheel, no matter from what angle the hand chain is pulled.

The chain is electrically welded with high tensile-strength, elastic-limit and elongation. The hooks are of the "safety" type, drop-forged, heat-treated and tested, and will open gradually under excessive load, allowing time to lower before the hook opens. As an added safety factor in case of overloading, all parts of the hoist in suspension are made of steel.

The line of Themac Precision Portable Electric Grinders made by The McGonigel Manufacturing Co., Rutherford, N.J., has been augmented by the addition of the Type J-4, illustrated herewith.



Themac Type J-4 Grinder

This grinder is similar in design to the Type J-1 which was described on Page 96 of the July issue of MODERN MACHINE SHOP. The Type J-4, however, is powered by a ½ h.p. universal motor operating on a.c. or d.c. 25-60 cycle current of the same voltage. The idling speed is 14,000 r.p.m. and full load speed is 10,000 r.p.m. The speeds obtainable

RIVETT ANTI-FRICTION SPINDLE BENCH LATHES BALL BEARING AND ROLLER BEARING

The earning power of an anti-friction bearing lathe with Speed Box Drive may well be twice, or three times that of an old type counter or jackshaft driven job.

Spindle is trouble-proof under all conditions.

Speeds are: Ball bearing, maximum 4800 R.P.M.

Roller bearing, maximum 2300 R.P.M.

Endless belt is replaceable in one minute.

Motor runs continuously.

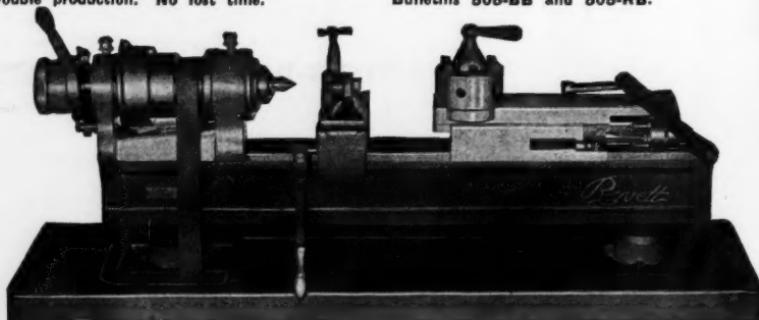
Speed Box gearing and multi-steel disc clutch are splash lubricated.

Brake is automatic and stops spindle instantly.

Lever Chuck Closer has hardened steel rollers to withstand severe continuous duty.

Double production. No lost time.

Bulletins 505-BB and 505-RB.

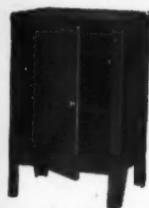


RIVETT LATHE & GRINDER INC. BRIGHTON, BOSTON, MASS.

STEEL EQUIPMENT

for Factory, Shop and Office

Regular and Built Special to Order



TOOL CABINETS



WOOD SEATED STOOLS



REVOLVING STOOLS



FOREMEN'S DESKS



MACHINE TENDERS



STEEL SEATED STOOLS



STOOL WITH DRAWER



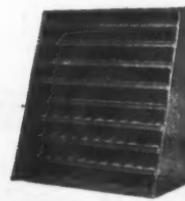
BENCH LEGS



STEEL TABLES



STEEL WORK BENCHES



DRILL & REAMER CABINETS

Write for Catalog MM-D for Complete Information

ANGLE STEEL STOOL COMPANY

PLAINWELL, MICHIGAN
"The Steel Equipment People"

are 5800, 9000, 18,000, 25,000, and 35,000 r.p.m.

The armature is dynamically balanced and is mounted on closed-type ball bearings. The grinding spindle is mounted on three open-type matched precision self-adjusting ball bearings. Equipment includes a wheel guard, five pulleys, four belts, cord with switch and attachment plug, five wheel collars, one cup wheel spacer washer, one $\frac{1}{8}$ -in. collet and collet nut No. 3, spindle screw for internal grinding, can of oil, three wrenches and clamp nut No. 2 for 9, 10, or 11-in. lathes. The five wheels range in size from $1\frac{1}{2} \times \frac{1}{4} \times \frac{1}{4}$ in. to $3 \times 1\frac{1}{2} \times \frac{1}{2}$ in. flaring cup wheel. The pencil wheels are $1\frac{1}{4} \times \frac{1}{8}$ in. shank, $\frac{3}{4} \times \frac{3}{8} \times \frac{1}{8}$ in. shank, and $\frac{5}{8} \times \frac{3}{8} \times \frac{1}{8}$ in. shank. Weight, 15 pounds.

"Spee-Dee" Dumore No. 11 Lathe Grinder

To meet the demand for a small lathe grinder of simple design and construction, The Dumore Company, 14th, Racine & Clark Sts., Racine, Wis., has brought out the No. 11 grinder which is to be known as the "Spee-Dee." This grinder will swing a 2-in. straight wheel and will grind internal holes $\frac{1}{2}$ -in.

diameter or larger to a depth of $2\frac{1}{2}$ in. With its $\frac{1}{8}$ -in. collet type chuck, it is also capable of grinding smaller diameters 1 in. depth. The grinding spindle operates at 6000 r.p.m. for external and 30,000 r.p.m. for internal work. Speeds as high as 42,500 r.p.m. can be obtained when needed. The grinder is vibration-



"Spee-Dee" Dumore No. 11 Lathe Grinder

less in operation due to the fact that the armature of its $1/5$ h.p. motor is dynamically balanced and the ball bearings are especially selected for this work. Forced ventilation assures cool running and continuous operation. Equipment includes two straight wheels, three mounted wheels, and a $\frac{1}{8}$ -in. chuck. The grinder is usable on practically any kind of machine tool.

A High Speed Sawing Machine at a Hack Saw Price

Designed and priced to come within range of the average shop or stock room, the MARVEL No. 4B will cut out all other saws in its price class. It is a really good saw—one of the fastest-cutting saws built—for miscellaneous or occasional work. However, for continuous production work we recommend the far heavier, all ball bearing MARVEL Nos. 6, 6A, 8 and 9A Automatic Production Saws.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"
345 N. Francisco Ave.
Chicago, U.S.A.



MODEL No. 4
CAPACITY
 $6'' \times 6''$

"Midget" No. 801 CP Universal Electric Drill

An electric drill which weighs but 2 lbs. 10 ounces and which will drill up to $3/16$ -in. diameter in steel is now being offered by Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. In addition to the extremely small size and light weight of the drill, outstanding features are efficient, modern motor design, two-pole switch with trigger and lock, box type brush holder, brushes, commutator and connections accessible with motor running, sealed ball bearings mounted in steel inserts which are cast integral, hardened helical gears, substantial checks and ample screws in the gear case, a full-size, heavy duty cord and cord protector, and the newly developed CP Straight-Line Airflow ventilating system by means of which a strong draft of cooling air is directed

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BETTER THAN DAYLIGHT

Cooper-Hewitts made an average inspector a "star"



An inspector, re-examining under Cooper-Hewitt Mercury Vapor Light goods passed as "perfect" under other light, found many hidden defects that had escaped previous notice. For a short time this inspector enjoyed an advantage over his fellow workers. But when this mill installed the detail-revealing Cooper-Hewitts in the weave room, fuzzy yarn caused by rough drop eyes, and heddles; slugs in yarn, and oil spots on warp were all caught while the cloth was still on the loom.

The Cooper-Hewitt Mercury Vapor

system provides lighting *quality* that reduces spoilage and labor turnover. Workmen operate during their entire shift without fatigue from eye-strain, for detail stands clearly revealed—even in the shadows. More economical production and full efficiency is maintained day or night.

Fewer rejects and less time lost on repairs mean more profits to management. A test is the most convincing proof. Write to the General Electric Vapor Lamp Company, 897 Adams Street, Hoboken, New Jersey.

GENERAL  **ELECTRIC**
VAPOR LAMP COMPANY

684C

COOPER-HEWITT MERCURY VAPOR LIGHT

over the gear case onto the work.

The design also includes a companion screw driver and nut runner with either positive or cushion clutch by change of gear case assembly. This feature is said



"Midget" No. 801 CP Universal Electric Drill

to be of importance to users of drills, screw drivers and nut runners.

Standard equipment includes a smooth body chuck and key and 10 ft. of 3-conductor cable and plug. The drill can be furnished for 32 volts or 250 volts on special order.

MULTI-PURPOSE POLISHER



Do Your

polishing, surfacing, disc grinding, etc., all on one machine . . . the "PRODUCTION" Type R. Saves space . . . improves work . . . cuts time and costs.

Many other types of polishing machines available. Write for circulars.

Production Machine Co.

GREENFIELD, MASS.

Athol Machine Vise

A milling machine and drill press vise with an easily removable swivel indexing base has been announced by Athol Machine & Foundry Co., 621 S. Kolmar Ave., Chicago, Ill. Used with the indexing base, machine operations requiring accurate angle settings are easily and conveniently handled. When removed from the swivel base, the vise is ideally adapted for drill press and other types of use. The indexing base is graduated to 180 deg. extending 90 deg. each way from zero. Two clamp bolts hold the vise bed in position on the swivel base.

The vise base, bed and jaws are semi-steel castings and jaw facings, which are removable, are of hardened tool steel. The vise screw has the Athol buttress thread, 50 per cent heavier at the root than the usual square thread of the same pitch. The extra metal and extra strength are provided where the strain is greatest. An extra heavy shoulder is provided on the vise screw. The crank handle is long enough for ample leverage and is removable.

The swivel base milling machine vise is available in two sizes, the No. 1024



Athol Machine Vise

with 4-in. jaw and the No. 1026 with 6-in. jaw. The depth of the jaw on the No. 1024 is 1 1/8 in. and the jaw opens 3 1/8 in. The weight is 45 lbs. On the No. 1026, the depth of jaw is 1 1/8 in. and the jaw opens 4 in. Weight, 70 lbs. Either model is available without swivel base if desired.

G-E 85-Watt Mercury Lamp

An 85-watt mercury lamp having a light output of 3,000 lumens and an unusually high unit brightness has been developed by the General Electric Vapor Lamp Company, 897 Adams St., Hoboken, N. J. The new lamp represents the latest step in broadening applications for bulb-type mercury lamps, which in the past two years have already achieved wide industrial and commercial use in the 400-watt and 250-watt sizes. The new

IT'S A PLEASURE TO MEASURE

WITH JOHANSSON
GAGE BLOCKS AND ACCESSORIES

• THIS toolmaker is checking the width of the splines on the gage he is grinding. He's using a Johansson Adjustable Holder with Jaws precision-spaced by Johansson Gage Blocks. It's an extremely accurate and quickly assembled measuring instrument. The convenient shape and size of such combinations is especially desirable in every toolroom. There are additional Johansson Accessories, all of which increase



the usefulness of Johansson Gage Blocks. • Ask your toolroom foreman if he is familiar with Johansson Accessories. They help increase the accuracy of toolroom work — save time for him and money for you. May we send you a catalog?

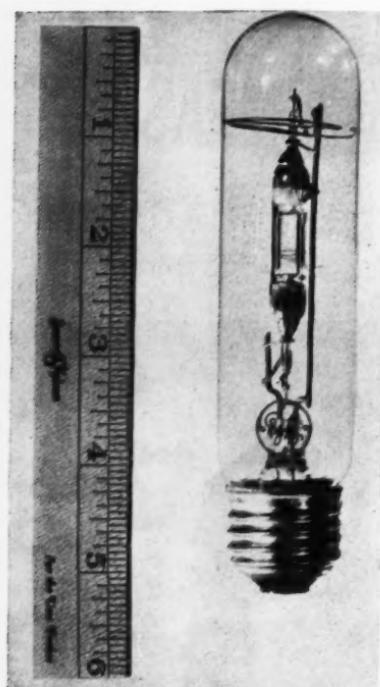
JOHANSSON
GAGE BLOCKS AND ACCESSORIES

Manufactured, sold and serviced in the United States and Canada by

FORD MOTOR COMPANY

Johansson Division

Dearborn, Michigan



G-E 85-Watt Mercury Lamp with Light Output of 3,000 Lumens

lamp is especially adapted for scientific and industrial uses where the combination of small size and unusual brightness is desirable.

The actual light source is a minute column of mercury vapor, less than an inch long, raised to an exceptionally high brightness within a sealed quartz

tube. This quartz tube is mounted within a Standard T-10 bulb, $5\frac{1}{2}$ in long and $1\frac{1}{4}$ in. in diameter, equipped with a standard screw base.

Light from the new lamp possesses color characteristics generally similar to other mercury lamps. Although there is somewhat more red radiation present, the light is predominately bluish in color quality. Thus it blends well with light from incandescent lamps, making possible new combination "mercury-incandescent" lighting units of relatively low power consumption with pleasing illumination similar in appearance to natural daylight.

In common with other vapor lamps the new bulb operates through a ballasting type of transformer on standard alternating current circuits. A special line of compact transformers for use with the lamp is available.

Imperial Line of Splash-Proof Squirrel-Cage Motors

The Imperial Electric Company, Akron, Ohio, announces a complete line of splash-proof, squirrel-cage motors in all ratings from $\frac{1}{2}$ to 200 h.p. for constant and multi-speed continuous or intermittent duty in all voltages and cycles for any torque and starting current. These motors, built with standard mounting dimensions, employ enclosing features that shield the inner parts of the motors completely from splash or spray, yet are properly ventilated through small openings in the bottom of the end bell for air intake and by louvres underneath the motors in the frame covers for air exit.

The frames are of the skeleton type of welded steel construction which provides the maximum of strength and rigidity. Stator laminations are pressed together to form a laminated block which is welded to the skeleton frame forming a stator structure which is

Here's a Real Spring Winder!

- No. 1 Capacity 0 thru $3/32$ " wire, \$1.25
- No. 2 Capacity 0 thru $3/16$ " wire, 2.50
- No. 3 Capacity 0 thru $5/16$ " wire, 5.00



HJORTH LATHE & TOOL CO.

Will Earn Its Cost in one Day

The HJORTH Perfection Spring Winder offers the ideal means of winding extension, compression, torsion, taper, double taper, or left hand springs. Try one in your shop. You'll like it and the price is reasonable.

12 BEACON STREET
WOBBURN, MASS.

August,

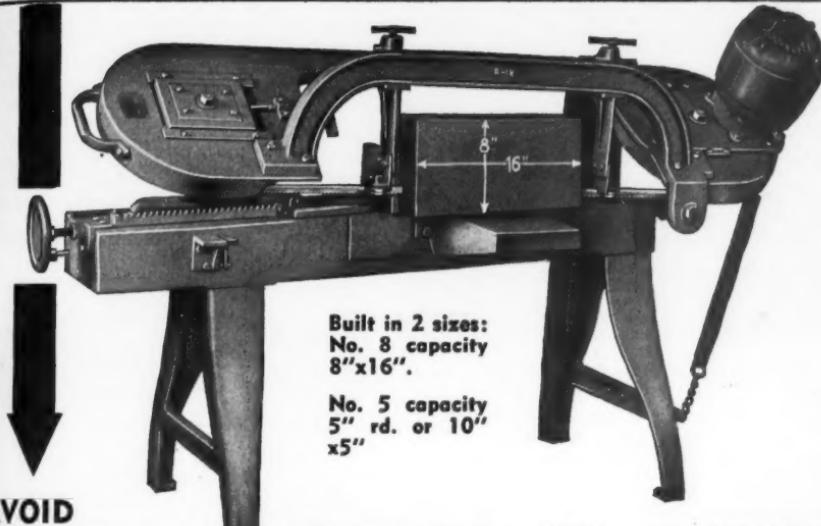
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**THE
THREE**

EXTREME PRECISION



Built in 2 sizes:
No. 8 capacity
8" x 16".

No. 5 capacity
5" rd. or 10"
x 5"

AVOID
RE-CUTTING
EXPENSE

Continuous cutting
without coolant.

LOW
BLADE
COST

THE WELLS MANUFACTURING CORPORATION
THREE RIVERS MICHIGAN

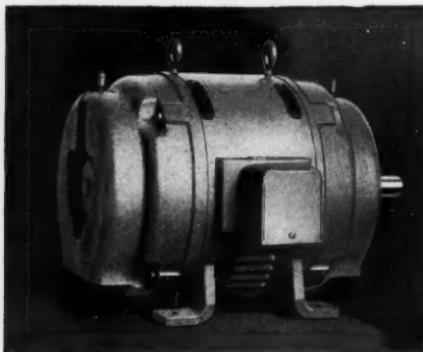
WELLS METAL CUTTING **BAND**
SAW Cuts hundreds of duplicate
pieces without showing a variation of
.005" in thickness.

Cuts all kinds of metal—hot or cold rolled machine steel, carbon tool steel, monel metal and alloys—with unerring accuracy in any shape at any angle. It will handle any metal—thick or thin, sheet, rod or tubing, up to the limits of its generous capacity. Cuts time and costs 30 to 50%.

Make the Wells Band Saw your tool for getting full capacity production at the lowest possible metal-cutting cost.

Send for the descriptive folder today.

closely knit and rigid. The end bells are so designed that before the air is forced over the coils, it must first be drawn up to and around the bearing housing and above the center-line of the motor, finally passing into the rotor



Imperial Splash-Proof Squirrel-Cage Motor

fan to be circulated over the coils. Thus it is utterly impossible for spray to pass beyond the end bell into the motor. Bearings are of the anti-friction ball bearing type mounted in special enclosed cartridges, completely and effectively sealed against dirt and moisture. The rotor can be removed from the machine without opening the cartridge enclosure.

Shafts are of high carbon steel of adequate size to assure strength and rigidity. All motors are built and tested in accordance with the recognized standards of the American Institute of Electrical Engineers and the National Electrical Manufacturers Association.

Magnusol

Metal parts of all kinds can be thoroughly cleaned by the use of a unique soap, soluble in either water or a solvent such as kerosene, now available from the Magnus Chemical Company, 22 South Ave., Garwood, N. J. This cleaning solvent, known as Magnusol, has properties which make it ideal for a wide variety of cleaning jobs in the maintenance of machinery and equipment. Magnusol is a scientifically perfected compound which readily makes all oils and greases rinsable with water.

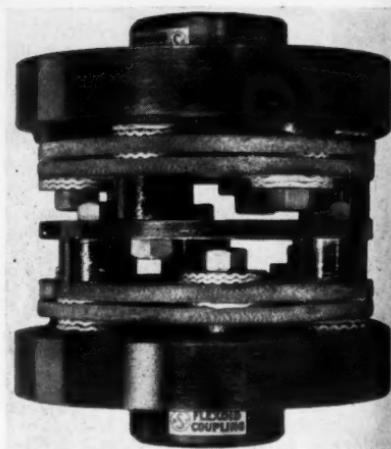
Magnusol is neutral and entirely safe to use. It is harmless to the worker and to the metal. Mixed in a ratio of one part Magnusol to six parts kerosene, Magnusol will remove grease stains and

streaks from floors, machines, motors, and so on. The solvent is supplied in 130-lb. and 420-lb. drums.

Superflex Flexoid Coupling

The illustration shows the Superflex Flexoid Coupling which has been put on the market by The Flexoid Coupling Co. Division of The Smith Power Transmission Co., Penton Bldg., Cleveland, Ohio. This coupling was designed to fill the need for a coupling for use in the field where the driver and driven units are not on a common base, and where there is a possibility of excessive angular shaft misalignment or where the drives are subject to a great deal of vibration and shock.

The Superflex Flexoid Coupling com-



Superflex Flexoid Coupling

prises two separate flexible units each of which is flexible in itself. The center part of the coupling is constructed of a single steel disk with spacers pressed into the disk thus providing a solid, rigid center driving section. While practically floating, the section is rigidly bolted through the flexible members to the driving flanges which are applied to both the driver and driven shafts.

There are no loose parts and the coupling is reversible. It will operate in any position, at either high or low speeds, and is noiseless in operation. It is balanced, light and clean. The coupling is not affected by temperature

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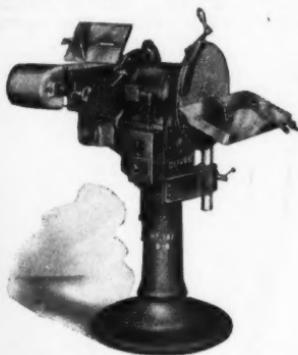
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changes, or by dirt or water, and no lubrication is necessary. Replacement parts can easily be inserted when necessary.

Oliver 15-In. Disk Grinder

The illustration shows a motor driven disk and belt grinder and polisher which has been developed by Oliver Machinery



Oliver 15-In. Disk Grinder

Co., Grand Rapids, Mich. The grinder will handle circular work up to 15-in. diameter and duplicating work up to 7 in. wide. The machine is especially intended for use in the grinding of bits of steel, metal, composition, and other small tough jobs of medium and light metal work which must be ground quickly and smoothly. The machine is most economical in accurately grinding and finishing pieces such as segments, angles for built-up work, circular and taper work, angle work, and so on.

The grinder is said to be precision built in every detail. Extra heavy ball bearings of the highest grade are used. Although the base is drilled for anchorage, the machine is portable and can be moved about as required. Being of rigid construction, there is no vibration. The disk is a 15-in. diameter aluminum plate turned true and accurately balanced. It operates at a speed of 1725 r.p.m. The disk head is a one-piece semi-steel casting which provides a housing for the disk, disk hub fan, and air passages for travel of exhaust through column to the floor. The disk hub fan is an aluminum casting, nicely finished and balanced and fastened directly onto the motor shaft. The rear part forms the exhaust fan.

The table, which is of cast iron, is 9½ in. wide, 21 in. long and 37 in. from

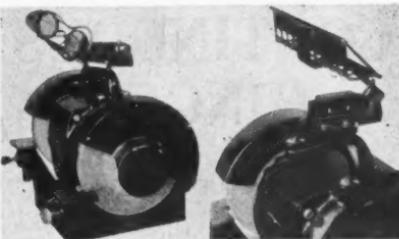
the floor. It is machined true and has a groove to take an angle gage and circle, segment and duplicating gage. The table can be tilted 45 deg. down or 25 deg. up by means of an 8-in. handwheel with swivel handle, worm, worm segment and segment.

The machine is powered by a ¾ h.p., 1750 r.p.m., 40 deg. continuous duty, ball bearing, totally enclosed, air jacketed motor for single, two or three phase, 60 cycle, 110 or 220 a.c. or d.c. current. Oversize ball bearings take both thrust and radial loads. The switch is mounted on the side of the motor convenient to the operator. Single phase motors have 10 feet of rubber-covered armored cord and plug for connection. Equipment includes one extra 15-in. aluminum disk, six aloxite or emery abrading disks, can of Sando Cement, angle gage, circle segment and duplicating gage with six centers, segment stop and pin.

Burgess Micro Switch

A safety-minded manufacturer—C. F. Burgess Laboratories, Inc., Freeport, Ill.—has enforced the use of goggles in his plant by the novel expedient of mounting a goggle tray on each of the grinding machines used in his plant. One end of the tray rests on the actuating plunger of a compact and sensitive electric switch which is connected into the grinder motor circuit.

As long as the goggles remain in the tray their weight is sufficient to main-



(Left)—Grinding machine equipped with goggles holder and Burgess Micro Switch. Grinder cannot be started until goggles are removed from the tray. (Right)—When the goggles are removed from the tray, the switch closes and automatically starts the grinder.

tain the switch in an open position so that the grinder motor will not start. When the operator removes the goggles to put them on, the weight on the switch is reduced and the switch snaps closed, starting the grinder motor. The

motor is started automatically when the goggles are removed but will not start if the goggles remain in the tray. Thus the employer is assured that his workers' eyes are adequately protected when they are using the grinder.

The switch, which is known as the Burgess Micro Switch, has been placed on the market.

Clark Lift Jack Unit

A unique method of storing and moving materials is afforded by the Clark Lift Jack Unit which has been developed by the All Steel Welded Truck Corporation, 8th St. & Railroad Ave., Rockford, Ill. The complete unit consists of a Clark Lift Jack Unit and a platform which rests upon two wheels and two legs in such manner that when used with the lift jack it comprises a complete lift truck. When the lift jack unit is disengaged, the truck platform becomes a skid which can be left standing while the lift jack is used elsewhere.

The platforms are of welded steel, a design which combines strength with economy. The lift jack unit is of extremely simple and unique construction which makes it strong, yet light and easy to handle. The unit consists of a

reinforced steel housing enclosing a fulcrum lift mechanism, designed and guaranteed to produce a lifting power of 6,000 lbs. distributed weight with only 76 lbs. handle pressure. The design with which this is accomplished also makes it possible to contact and lift the platform skid from right or left angles. The head room required to lift a skid is only 12 in., thus permitting the storage of materials in a limited amount of floor space and saving the operator's time.



Clark Lift Jack Unit

AUTOM CONTINUOUS HINGES

STANDARD TYPES AND
SIZES CARRIED IN STOCK

SPECIAL HINGES
MADE TO ORDER

USE OUR HINGE CHART
TO SELECT SPECIFICATIONS

Write

AUTO MOULDING & MFG. CO.

Hinge Div.

2326 S. CANAL ST.

CHICAGO

The lift jack unit is light in weight, weighing not more than 42 lbs. It is regularly equipped with two wide face semi-steel wheels, 8 in. in diameter and equipped with Hyatt type roller bearings. Rubber tired wheels may be had if desired. The handle is of tubular steel. When the platform is engaged the handle is entirely free, enabling the operator to move the load with the handle at any angle that provides the greatest ease and leverage. When the handle is brought forward to the horizontal position, the platform is raised approximately $\frac{3}{4}$ in. from the floor. To disengage, it is only necessary to trip the foot lever.

Platforms may be had in combination metal bound with wood deck and steel bracing, combination with wood deck double side rails and armored ends.

There's a
No. 11
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NOW... DUMORE PRECISION *Only \$59⁵⁰*



There's a new addition to the Dumore family—the No. 11 "Spee-Dee"—a lathe grinder designed to bring the many advantages of Dumore portable grinders to those wishing to invest only a limited sum. It is the **LOWEST PRICED** Dumore internal-external grinder **EVER OFFERED**—it's backed by 23 years of precision-tool manufacturing experience. It boasts automatic adjustment of

both motor and grinding spindle bearings . . . "fog of oil" lubrication . . . spindle speeds 6,000 r.p.m. and 30,000 r.p.m. . . . forced ventilation for cool running in continuous duty . . . vibrationless construction . . . and many other features heretofore available only in "big" Dumore grinders. See this amazing new tool at any Dumore distributor's.

ASK YOUR DISTRIBUTOR FOR A *Free* DEMONSTRATION

THE DUMORE COMPANY,
Dept. 186-H, Racine, Wis.

Please send complete information on the
New Dumore No. 11 Lathe Grinder.

Name _____
Address _____
City _____ State _____

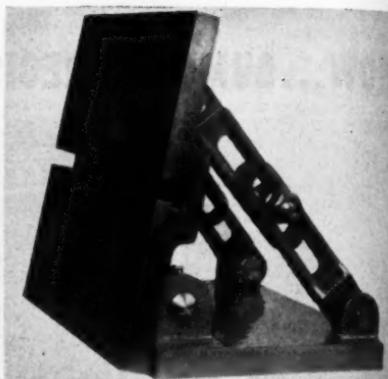
DUMORE
HIGH SPEED PRECISION
GRINDERS

(Price of the No. 11 slightly higher west of the Rockies and in Canada).

wood with steel braces only or all steel. Rigid construction is the feature of the platform, the steel welded frame, cross members and auxiliary units providing assurance of long life and ability to withstand rough usage. The wheels are 9 in. diameter and the legs are of 5/16 in. thickness and 2 in. wide.

Creco Adjustable Angle Plate

The illustration shows an adjustable angle plate which is now being marketed by the Crescent Engineering Company, 1207 E. 25th St., Baltimore, Md. The plate is designed for use on the planer, milling machine, shaper, or anywhere that angles are concerned. It is sturdily built, comprising a base and surface plate hinged together at one side and attached at the other side by a pair of adjustable links which make it possible to set the surface plate at any angle desired within a range of 45 deg. A scale graduated in degrees is carried on one of the interlocking supports to facilitate setting. Where extreme accuracy is desired, a 10 in. sine bar is obtainable at an additional small charge. The sine bar will be attached to the plate by the manufacturer. The T-slot in the surface plate is intended for $\frac{5}{8}$ -in. bolts

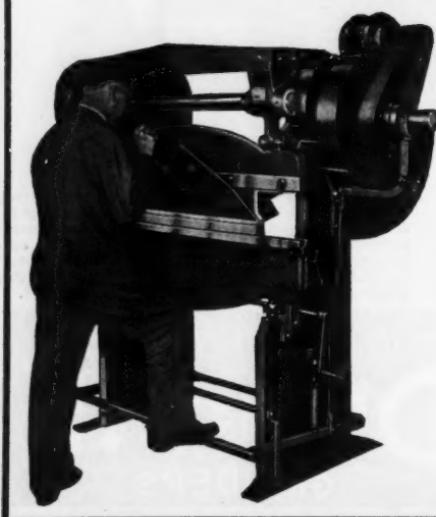


Creco Adjustable Angle Plate

and properly sized so that key steel may be used for aligning work.

The castings from which the Creco Angle Plate is made are properly normalized so that it will retain its accuracy for an indefinite period. The face of the surface plate is 12x12 in. and the base is 9x12 in. Weight, approximately 75 pounds.

THIS No. 253 CHICAGO STEEL PRESS



Will Do 40% to 60% of the Forming Work Turned Out by the Average Shop

This compact, ruggedly built, 48", No. 14 gauge capacity, Chicago Steel Press brake is an economical and profitable production unit. It is ideally adapted for rapidly forming metal sections such as in stoves, refrigerators, soda fountains, steel cabinets, metal furniture, steel boxes and a great variety of sheet metal specialties. Variable speed drive operates from 17 to 50 strokes per minute. Precision built of highest quality materials by master craftsmen.

Write for Circular No. 253

**DREIS & KRUMP MFG.
COMPANY**

7418 LOOMIS BLVD.

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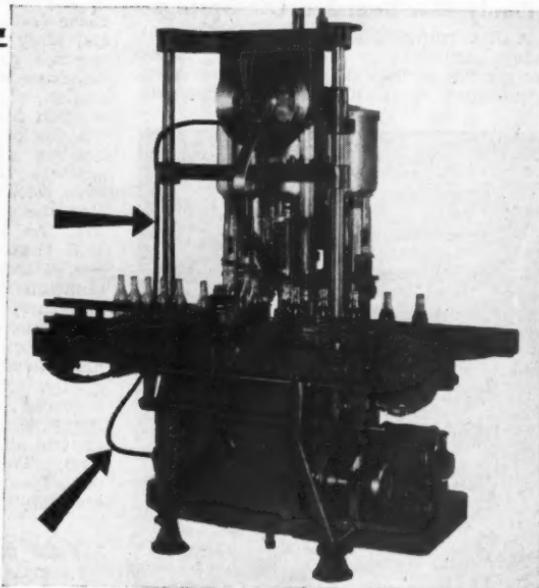
FLEXIB

14-Tube Automatic Rotary Bottle Filler and Capper.—Product of the Horix Mfg. Co. of Pittsburgh, Pa.

**The
SIMPLE
WAY to
transmit
power
to various parts of a machine**

In the machine illustrated, a selector near the top takes bottle caps from the hopper and places them right side up in the cap chute. This selector is driven from the main worm shaft by means of a 6-foot S. S. WHITE FLEXIBLE SHAFT.

In many machines it is necessary to take power from the main drive to operate some other part. A simple way to do it is with a flexible shaft, a single, self-contained unit that can be readily



connected to driving and driven members regardless of their relative locations and positions.

And where it is necessary to establish speed ratios, the flexible shaft can be connected through simple gearing.

We will be glad to supply data about flexible shafts for auxiliary drives and to cooperate in working out specific applications. Don't hesitate to put your problems up to us for it involves no obligation.

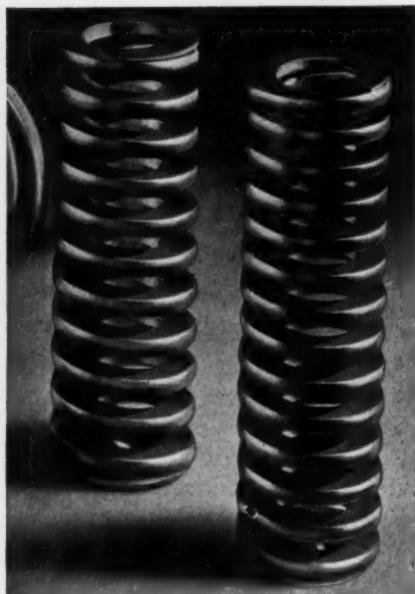
The S. S. WHITE Dental Mfg. Co., INDUSTRIAL DIVISION

10 East 40th Street, Room 2310S, New York, N. Y.

FLEXIBLE SHAFTS FOR POWER DRIVES AND FOR REMOTE CONTROLS

Danly Flat Rounded Die Springs

A flat rounded die spring which develops an entirely new type of cross section for springs of this class has been announced by Danly Machine Special-



Danly Flat Rounded Die Springs

ties, Inc., 2130 S. 52nd Ave., Cicero, Ill. The spring is coiled from keystone wire which, when coiled, assumes a rectangular cross section developing the full strength of the wire and increasing flexibility, travel and fatigue life.

In developing the present spring, every known type of spring steel was tested

to destruction in fatigue tests. From these tests a spring steel wire of a special alloy with the keystone section was selected as giving the present practical ultimate in fatigue life. After the selection of the steel a section was developed for each of the 15 standard free lengths of flat rounded die springs embracing diameters by $\frac{1}{4}$ -in. (hole diameter) from $\frac{3}{4}$ -in. to 2-in. Stresses were selected for each size of spring to give the highest load capacity and long life. As a result of this research, it is said that this line of springs is engineered to give the greatest possible combination of life, flexibility, compression and carrying capacity for hole size that is commercially practicable.

The coiling is all done by automatic machinery and following coiling of the spring, each spring is heat treated by a special, carefully controlled heat treating process utilizing three-zone furnace control and fixed oil quenching temperature. The springs are quenched without exposure to the air, after which they are drawn and japanned.

Yale & Towne Counterweighted Fork-Type Pallet Handling Truck

Many shippers are shipping merchandise on wooden pallets which are so constructed that there is about two inches of clearance under the load, which is a good idea for the shipper but creates a problem for the customer at the other end of the haul. To meet this problem, the Yale & Towne Mfg. Co., Philadelphia, Pa., has brought out the Yale Fork Type Truck with tilting forks and counterweighted front end, illustrated herewith. This truck will handle both single-faced and double-faced pallets, and can easily be operated by one man. It is said that the truck is especially useful for handling bulky loads.

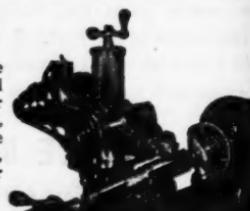
MASTER Lathe Converter

• A sturdy, dependable converter that fits into your lathe tool post T-slot of compound rest and gives you a universal range machine with which you can do an unlimited number of precision milling, grinding, internal grinding, broaching, angular drilling and valve re-facing operations. Takes the place of a large amount of expensive, individual machinery, with only nominal investment. Satisfied customers all over the United States.

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KNURLED**UNBRAKO****Socket Head Cap Screw**

Every mechanic, when driving screws, will invariably use his fingers as much as possible, because they are much handier than any wrench and save time.

With the Knurled "Unbrako" he can drive much faster, as his fingers actually become geared to the Knurled Head so they can't slip.

Smooth Head Screws, hard to get hold of are much slower to drive.

The Knurled "Unbrako" is of exactly the same high quality as the smooth head "Unbrako",—

**BUT COSTS
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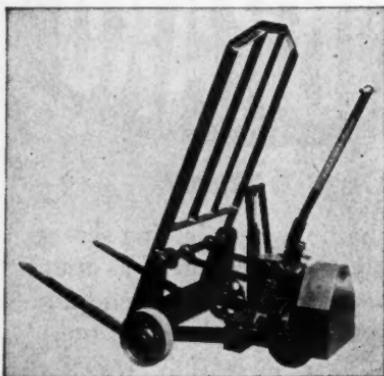
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Fingers become geared to
the knurled "Unbrako"
and therefore can't slip



The truck is designed with a multi-stroke head; thus a few strokes on the handle will lift the load and tilt it to ride safely. One man can easily move



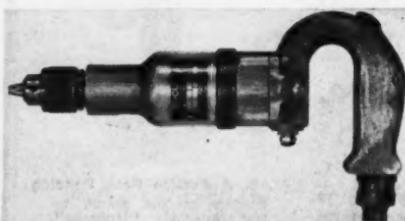
Yale & Towne Counterweighted Fork-Type Pallet Truck

it to its destination on the large ball bearing steel wheels. A large hydraulic release check mounted between the lifting head and the load rack makes it easy to drop the load when pressure is exerted on the treadle which is located at the side of the head.

The truck is of simple construction and all wearing parts are easily lubricated. The Model KATC truck, shown in the illustration, has capacity of 700 to 1125 lbs. and is equipped with forks 31½ in. long x 2 in. wide.

Hercules No. 016-4 Pneumatic Drill

The Hercules No. 016-4 Pneumatic Drill shown in the illustration has been brought out by The Buckeye Portable Tool Co., Dayton, Ohio, to meet the need for a light pneumatic drill for use on such work as the fabrication of bus bodies, airplanes, refrigerator cabinets



Hercules No. 016-4 Pneumatic Drill

and so on. The drill has capacity up to ¼ in. and operates at a speed of 2200 r.p.m. The length overall is 12 in. and the weight is 4½ pounds.

The drill is of small and compact design, light in weight, and can easily be held and operated with one hand. Power is controlled by means of a thumb lock throttle. The air motor operates the chuck spindle direct through planetary gears and the tool is ball bearing throughout. The air motor itself is the original Hercules rotary principle and its smooth operation is claimed to reduce drill breakage to the minimum.

Swedish Gage Co. Micrometer Caliper

A lead screw that is hardened, ground and lapped is the feature of the new micrometer caliper which has been placed on the market by the Swedish Gage Co. of America, 7310 Woodward Ave., Detroit, Mich. The lead screw is hardened throughout its entire length providing the maximum of resistance to wear. The threads are ground after hardening; thus there is no possibility of distortion and consequently no loss

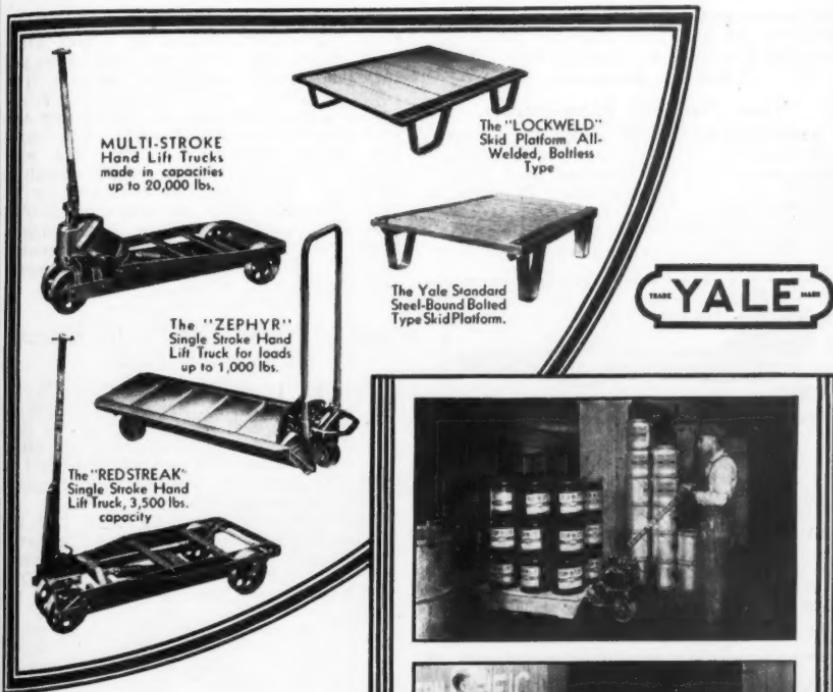


Swedish Gage Co. Micrometer Caliper

in accuracy due to the hardening process.

After grinding, the threads are lapped to rectify any slight errors which may occur in the pitch diameter and lead. The lapping process further improves the wearing qualities by removing grinding wheel marks. The smooth surface resulting from the lapping operation also gives the micrometer a smoother action in use.

Inasmuch as any slight variations in the pitch diameter are eliminated by the lapping process, the fit between the lead screw and the lead nut is constant throughout the length of the screw, permitting a tighter adjustment of the nut without binding. It is stated that the accuracy of the micrometer equipped with a hardened, ground and lapped



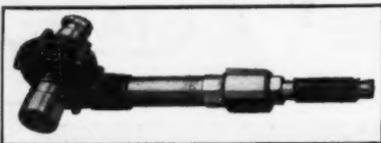
THE lifting and hauling of materials, though it adds nothing to the value of a product, is an essential operation in every industrial plant. Materials handling cannot be eliminated but it can be done more swiftly, safely and economically—by means of a Yale Hand Lift Truck and Skid Platform System. Yale Trucks are distinguished for their speed, their ease of operation, their durability and long life. There are models to fit every requirement and the list of Yale users reads like a blue book of American industry.

THE YALE & TOWNE MFG. CO.
Philadelphia Division Philadelphia, Pa., U. S. A.

lead screw is so uniform that the overall accuracy of the tool can be definitely controlled within extremely close limits.

Thor No. 603 Hamerench

A pneumatic tool in which the actions and function of a hammer are combined with those of a wrench has been introduced by the Independent Pneumatic Tool Co., 610 Jackson Blvd., Chicago, Ill. This tool, to be known as the Thor No. 603 Hamerench, can be used to apply or



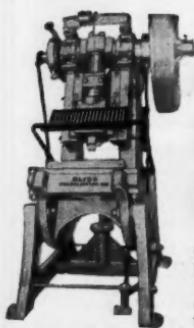
Thor No. 603 Hamerench

remove any type of nut. Being of the right angle type and operating horizontally to the application, the tool can be used in places absolutely inaccessible to the straight machine.

The principal of operation of the Hamerench is unique but effective. With the wrench in place on the nut, the

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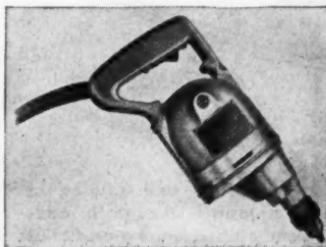
JUNKIN SAFETY APPLIANCE CO.
930-938 W. Hill St., Louisville, Ky.

application of power operates the hammer mechanism, delivering direct hammer blows at a speed of 1800 blows per minute at right angles to the nut. The rapidity of the blows produces a rotating action, loosening or tightening the nut almost instantaneously. The working space required for the tool with socket is 8 in. and the length overall is 22½ in. The tool has capacity for all sizes of nuts and all sizes of flexible staybolts. The shank is 1 in. square and the weight is 25 lbs. Equipment includes a chuck 1½ in. hex. across the flat.

Signal Model OB-4½ In. Electric Portable Drill

An improved, standard duty ¼ in electric portable drill, to be known as the Model OB-4, is announced by Signal Electric Mfg. Co., Menominee, Mich. An outstanding feature of the drill is that the handle is ventilated and houses both the switch and the cord.

In other respects the drill has the same general specifications as the standard Signal ¼ in. drill. It is powered by a Signal A.C. or D.C. motor. The housing is of aluminum alloy and the



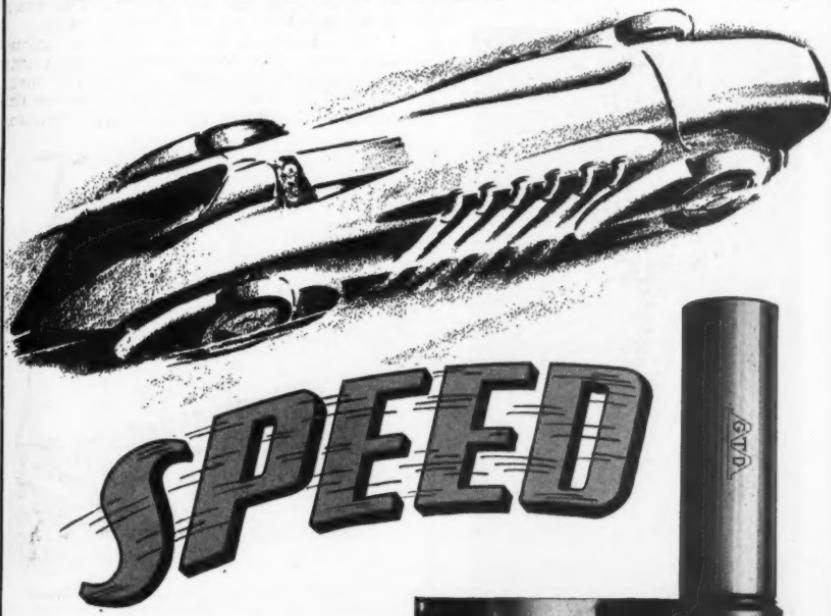
Signal Model OB-4½ In. Electric Portable Drill

drill is equipped with a three-jaw chuck. Gears are of special alloy steel, heat treated. The no-load speed is 1700 r.p.m. Standard equipment includes 8 ft. of heavy duty rubber covered cord and a rubber plug.

Barrett Oneton Checkless Lift Truck

A new development in lift-truck design — a checkless lift truck that is safe and easy to operate — has been brought out by Barrett-Cravens Company, 3255 W. 30th St., Chicago, Ill. The Barrett "Oneton" is available to work with any

"ACORN" DIE FACTS from Haskins

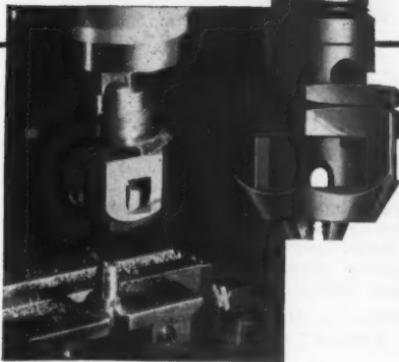


Every month more jobs are being switched to "Acorn" Dies. Their fine and positive adjustment give closer initial tolerance and far greater sustained accuracy than any other method of production threading. And as for speed—when high speed steel "Acorn" Dies turn out twelve hundred $\frac{1}{2}$ -20 parts per hour, threaded to a shoulder, no more need be said.

There is still another important "Acorn" Die characteristic which saves money for the user; "Acorn" Dies can be changed in a few seconds—and when dull, can be easily resharpened in less than a minute. Try them on any job that needs speeding up—they will make good.

**GREENFIELD TAP & DIE CORP.
GREENFIELD, MASSACHUSETTS**

Detroit Plant: 2102 West Fort Street
Warehouses in New York and Chicago
In Canada: Greenfield Tap & Die Corp. of
Canada, Ltd., Galt, Ont.



Manufacturer of high speed tapping machine reports production of 1200 $\frac{1}{2}$ -20 threaded pieces per hour. Speed 1100 R. P. M. "on" and 2200 R. P. M. "off." Material: zinc die casting.

GREENFIELD

"GUSHER" PUMPS



MODEL 11022

GIVE SPLIT SECOND DEPENDABLE FLOW!

Instant supply of coolant saves time and cutting edges of tools.

In "GUSHER" PUMPS, the possibility of failure has been practically eliminated. Utmost simplicity of design and positive, gravity priming guarantee instantaneous and steady flow.

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THE RUTHMAN MACHINERY CO.
536 E. Front St., Cincinnati, Ohio

type, make, or size of skids. It can be had in 6, 7, 9, and 11-in. heights and either 18 or 24-in. widths. The length of the carrying frame ranges from 24 to 72 in. and the lift is 2 in. The truck is designed to carry 2,000-lb. loads.

The operation of the truck is unique and safe. No foot treadle engagement is necessary in order to lift the load; the load is raised by pulling down on the handle. To lower the load, the operator



Barrett Oneton Checkless Lift Truck

first steps on the release treadle, then lowers the handle to completely disengage the latch. From this point the load is controlled downward by the operator's grip on the handle. The wheels are equipped with Hyatt roller bearings.

Speedway Worm Drive Back Geared "Flea Power" Motor

A "flea power" worm drive back geared motor available in A.C., D.C., and Universal types and which can be assembled with drive shaft to right, left, up or down, has been brought out by Speedway Manufacturing Company, 1834 S. 52nd Ave., Cicero, Ill. These features, it is claimed, simplify mounting problems and eliminate the need for complex and angular drives.

Other features of these small back geared motors include unusual quietness resulting from the improved worm on the primary reduction and straight, wide-faced, cut steel gears on the final reduction; novelty of matched end castings, one of which carries all reduction gears.

Without disturbing production schedules YOU CAN EFFECT THIS ASSEMBLY MODERNIZATION



THESE are no need for most production officials to wait for a slack period, or until a new model is designed, to put into effect the modern, simplified method of assembly offered by Parker-Kalon Hardened Self-tapping Screws. Practically speaking, a change from the comparatively complicated and costly practise required by common fastening devices to the time-labor-money saving Self-tapping Screws can be made overnight.

So adaptable are these famous Screws to all kinds of metal and plastic assemblies that usually it is only necessary to substitute them for machine screws, bolts and nuts, rivets, etc. Designs need not be changed. Special tools are not required. Skill is not necessary. With a few moments instruction any operator can make perfect fastenings.

Use this specialized knowledge to determine what you can gain

Right now your assembly work probably holds

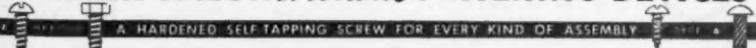
worthwhile opportunities for using Self-tapping Screws to make better, stronger fastenings at lower cost. It will pay you to hunt them out. And it is easy to do . . . if you use the specialized knowledge of Parker-Kalon Assembly Engineers.

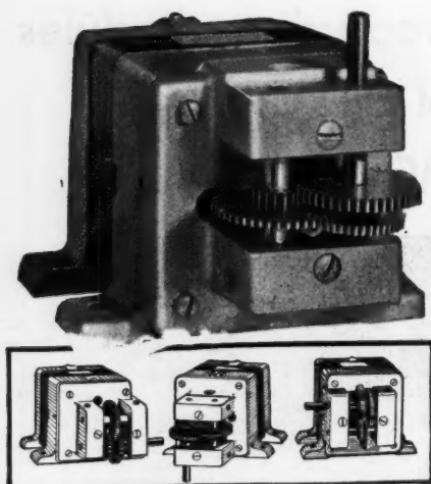
Your invitation will bring one of these Engineers to go over your fastening jobs with you. He will offer no "cure-all". A background of practical assembly work fits him to render intelligent aid. And his specialized knowledge enables him to recognize the many different types of assemblies which Hardened Self-tapping Screws WILL make better and cheaper. Because in 7 out of 10 cases he has helped production and design men to obtain desirable benefits, there is an excellent chance that he can help you, too.

PARKER-KALON CORPORATION

Dept. M, 198 Varick Street New York, N. Y.

PARKER-KALON Modern FASTENING DEVICES





Speedway Worm Drive Back Geared
"Flea Power" Motor

that fit to the motor case; a wide range of speeds on the final shaft; 1, 7, 11, 40 or 80 r.p.m on the A.C. or D.C. unit

as standard speeds and many others available; the extremely small size (2½ x 3 x 4 in. including the reduction gears); high starting torque, and low inputs from 4 to 15 watts.

SKF Grip-Lock Bearing

The SKF Grip-lock bearing is the latest addition to the line of anti-friction bearings, comprising in all more than 1200 sizes and types of ball and roller bearings, made by SKF Industries, Inc., Erie and Front St., Philadelphia, Pennsylvania.

The Grip-lock principle offers the advantage of quick, simple application of the bearing without tools of any kind and insures the user of a bearing positively locked to the shaft.

Essentially, the bearing is conventional, well-known SKF self-aligning extended inner race bearing with an eccentric groove machined in the bore of the inner race. Fitted in the eccentric groove is a piece of spring steel known as the Grip-lock shoe. When the shoe is in the deepest part of the eccentric groove, the bearing may be readily slipped on the shaft. Then, by holding the inner race of the bearing while the

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**FLEXIBLE SHAFTS
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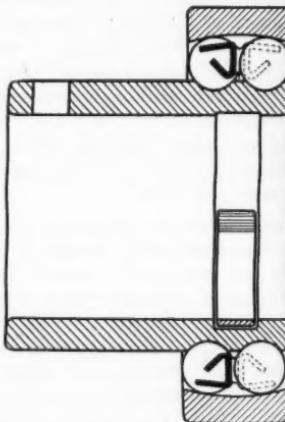
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1725 to 10,400
R.P.M.**

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**N. A. STRAND
& CO.**

5001 N. Lincoln St., Chicago, Ill.



SKF Grip-Lock Bearing

shaft turns in the direction of operation, the knurling at the ends of the grip-lock shoe grips the shaft causing the shoe to wedge in the shallow part of the eccentric groove thus securing locking the bearing on the shaft.

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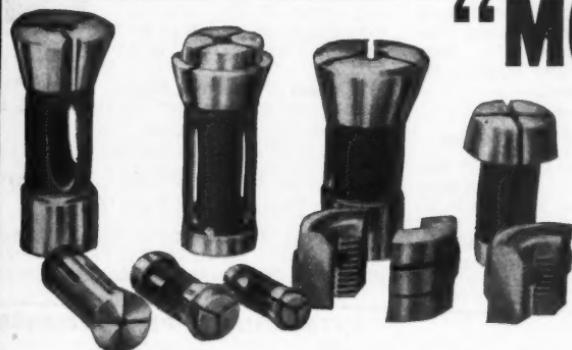
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CINCINNATI, O. U. S. A.



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COLLETS

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**ECONOMY
ACCURACY
LONG LIFE**

MODERN COLLETS are made of a special steel and have a hard, long-wearing surface with a tough, springy core. They are guaranteed accurate in design and taper is ground true with the hole. The deeper, better formed corrugations insure positive gripping. Lock-

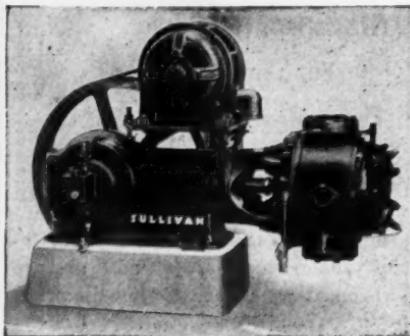
ing fingers and shoes will last longer, and MODERN COLLETS exert far less strain on chucking cam and chucking cam roller pin.

Write for our catalog on feed-fingers, cams, shaving tools and other screw machine parts.

MODERN COLLET & MACHINE COMPANY
401 SALLIOTTE ST. ECORSE, MICH.

Sullivan Timken-Equipped Heavy Duty Compressor

The Sullivan Machinery Company, Michigan City, Ind., announces a stationary heavy duty air and gas com-



Sullivan Timken-Equipped Heavy Duty Compressor

pressor of the single stage, single cylinder, double acting horizontal type, built in sizes from 10 to 50 h.p. and for pressures of from 5 to 150 lbs. Features stressed are Timken double row main bearings, replaceable cylinder liner and crosshead guide, tinned piston and crosshead, and the streamline long life valves. Advantages claimed for this compressor are long life, low power cost and fully automatic operation.

Goodrich "Hipress" Air Hose

Hipress air hose, a hose especially designed for all kinds of air tool applications, has been announced by The B. F. Goodrich Company, Akron, Ohio. The construction of the hose is unique in that it is a combination construction made in long lengths. The inner car-

cass consists of four plies of especially woven duck and the outer carcass is a tight braid of high tensile cords which are applied with a tension ten times that normally used on long length braided hose. Between the inner and outer carcasses is a substantial insulation which serves as a secondary tube to seal off penetration of air through the walls of the hose and to cushion blows from the outside.

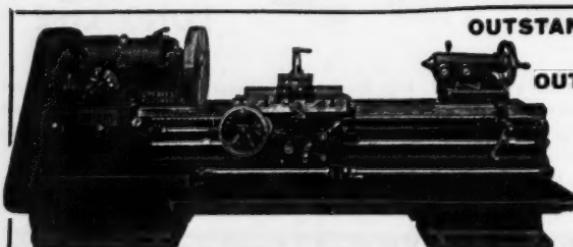
The wrapped construction of the inner carcass provides an ideal backing for the tube due to the fine weave of the fabric. Due to the bias design of the wrapped fabric, any air or fluid which reaches it travels only a short distance before reaching the terminal point of the yarn, thus preventing penetration throughout the entire length of hose.

The tube is a special rubber, capable of resisting both oil and heat. It is claimed that this tube will not only last longer where oil is present, but it will not break into loose particles and clog the tools. The rubber cover of the hose is compounded to withstand abrasion and abuse.

Hipress air hose is furnished in three sizes: $\frac{1}{2}$, $\frac{3}{4}$ and 1 in. and in 500 ft. lengths.

Yale & Towne High Lift Heavy Duty Hand Lift Truck

To meet the need for a hand lift truck that will lift up to 10 in., Yale & Towne Mfg. Co., Philadelphia, Pa., has brought



THE GREAVES-KLUSMAN TOOL CO., Cincinnati, O.

OUTSTANDING PERFORMANCE provided by

OUTSTANDING FEATURES

G. K. Single Lever Control Lathes will give you the production efficiency you want on your lathe work. Write for catalog describing complete details.



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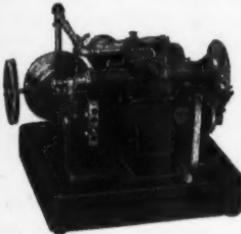
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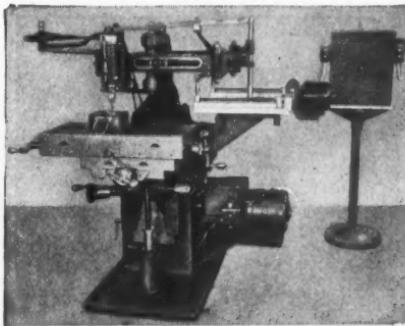
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"Waltham" Pinion Cutting Machines



Are made with a variety of equipments. They will make the two or three successive cuts needed for watch pinions or may be used for fine pitch gears up to 1 1/2" diameter. There is also a 4" size. If you will describe your work we will send details.

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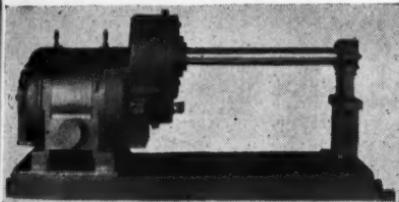


Marquette Three Dimensional Universal Engraving Machine

This new Diesinking and Profiling machine is specially designed for quickly and accurately cutting dies and molds in third dimensional direction as well as flat work, design pieces, lettering, profiling, etc. All motions are automatically controlled — also semi-automatic if desired.

Write for full details.

Marquette Mechanical Eng. Co.
3360 Beekman St., Cincinnati, Ohio
4346 Lake Park Ave., Chicago, Illinois



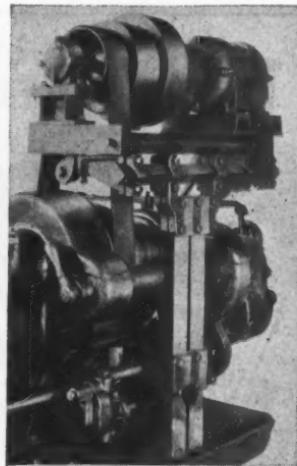
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• These drives make your machines independent of line shaft location or operation. They often increase production as much as 50%. The 3 bearing drive shown above is the basis of all of our designs. It can be furnished for floor mounting, or, with our supports, for mounting directly on lathes, screw machines, shapers, millers, and other tools. Furnished with heavy duty anti-friction bearings thruout, it maintains accurate alignment and delivers a smooth flow of power under all operating conditions.

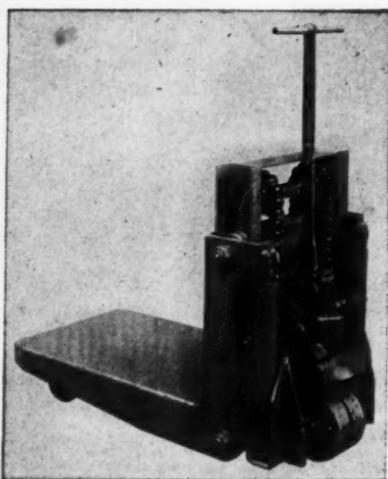
Easily installed.

Reasonably priced.

THE PRODUCTION EQUIPMENT CO.
5219 Chester



REAR VIEW OF SCREW MACHINE DRIVE



Yale & Towne High Lift Heavy Duty Hand Lift Truck

out the truck shown in the illustration. This truck has a lift of 10 in. and a capacity of 8000 lbs. It is equipped with

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DETROIT BUFFALO

Write for free copy of Steel User's Data Sheets, containing valuable information on the use and treatment of special steels.

chain lift, and the capacity load may be elevated to full height by one operation. Twenty-two forward strokes of the handle elevate the load.

The sturdy covered deck raises on rollers in the channel uprights. The load is lowered without a jar as a result of the use of two heavy duty hydraulic release checks. Twin front wheels and full side lift makes this truck easy to maneuver even in close quarters. Smooth-faced wheels mounted on heavy duty ball bearings make it possible for two men to pull heavy loads without straining.

G-E Cycle Recorder

A cycle recorder designed to provide pictorial evidence of the length of time a current flows in an alternating current circuit is available from General Electric Company, Schenectady, N. Y. The recorder is designed for use with resistance welder timers or as a means of producing a permanent record of a weld time. By indicating when an accurate resetting of welding time is attained, the recorder



G-E Cycle Recorder

will be found very useful in the duplication of welds previously found to be satisfactory. The instrument therefore not only records the optimum welding time for a specific job as determined by experiment, but enables the production welding machines to be easily and quickly set to reproduce this time. It furnishes a check on the proper functioning of welder timers, and is of assistance in locating the cause of spoiled work.

The device records, on a strip of paper, the cycles of duration of current



• **NEW ABRASIVE BAND GRINDER . . .**

"Built Like a Machine Tool"

The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on the belt. Ball bearing throughout. Equipped with ALEMITE LUBRICATION, complete with grease gun.

Write for illustrated folder on this and other styles and sizes.

HORMEL-M GRINDER

WALLS SALES CORP.

96 WARREN ST. NEW YORK, N. Y.



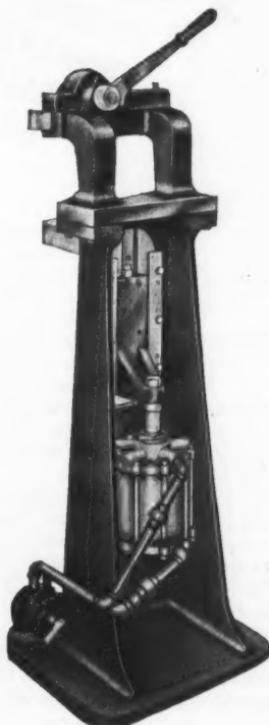
Repair it with "Ferroweld"

In repairing cracked cast iron parts, you can produce welds of greater tensile strength than the cast iron itself with "Ferroweld" electrode. Operating at low heat, it practically eliminates severe strains during welding, hence avoiding cracking and hardening at line of fusion. Welds are more readily machinable than with ordinary cast iron rods.

Write for Electrode Procedure Bulletin

THE LINCOLN ELECTRIC CO.
Department E-297 Cleveland, Ohio
Largest Manufacturers of Arc Welding Equipment in the World

MARKING
FLAT—ROUND
IRREGULAR SURFACES
BY ROLLING
OPERATION



**MODEL 25
HI-DUTY MARKING MACHINE**

This machine operates from your plant air line, and is one of numerous models built to produce fast, neat marking on metal parts. Hi-Duty marking machines may be had for practically any marking operation, and we will be glad to make recommendations upon receipt of your inquiries. Send prints or samples of parts to be marked, showing lettering and location, also state required production.

GEO. T. SCHMIDT, Inc.
1806 BELLE PLAINE AVE.
CHICAGO, ILL.



DeLuxe Model

\$18.50 POSTPAID
6 Accessories
FREE

production line in large and small plants—making, shaping, polishing all metal products, alloys, glass, composition materials, wood, stone, etc.

Use this amazing tool for difficult precision jobs and hard-to-get-at places on intricate machine parts without removing the parts or dismantling machine. 200 different accessories available.

Fastest and most powerful tool for its type and weight ever developed. 25,000 r.p.m. Weight 12 ounces. Almost human in its smooth, rapid response. Try a Handee! Test for yourself its marvelous efficiency.

*Order Today on 10 Days
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CHICAGO WHEEL & MFG. CO.
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CHICAGO, ILL.

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 Send De Luxe Handee on 10-Day Trial

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M. M. S. —

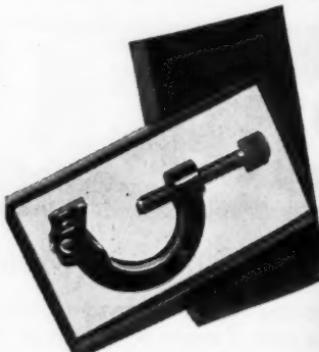
flow. It is oscillographic in nature but no attempt is made in the design to make it follow wave form accurately. It comprises a compact unit, $5\frac{1}{2} \times 7\frac{1}{2} \times 7\frac{1}{2}$ in., containing a frequency-responsive element, marking mechanism, paper-tape drive, and paper tape supply.

The frequency-responsive element is a polarized reed driven by a coil which surrounds it. This driving coil is tapped to use at either one or five amperes although a 110 volt coil can be obtained if desired. The reed vibrates and follows the alternations of the current.

The recording device is inkless and of simple design. A stylus carried by the vibrating reed presses lightly on a moving strip of thin paper under which rotates a graphic roll. The paper is so thin that the record can be read from either side and a 2000-ft. roll, which is one loading for the cycle recorder, is only 5 in. in diameter.

Dumore Diamond Point Grinding Wheel Dresser

To provide an efficient means of dressing and trueing the grinding wheels which are used on lathe grinding attach-



Dumore Diamond Point Grinding Wheel Dresser

ments, The Dumore Co., Dept. 186, Racine, Wis., has developed the grinding wheel dresser shown in the illustration. The dresser is designed so that it can quickly and easily be clamped to a shaft or stub end of a piece of steel held in the lathe chuck, convenient for contact with the grinding wheel. If the work being ground is not larger than the capacity of the dresser, there is no ne-

GRANT RIVETERS

Pioneers in the riveting field. Head rivets from smallest to $\frac{1}{8}$ " diameter, either by noiseless spinning or vibrating hammer method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature—and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
96 Silliman Avenue Bridgeport, Conn.

**Why Use A Shaper
to cut Keyways when a**

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KEYSEATER**

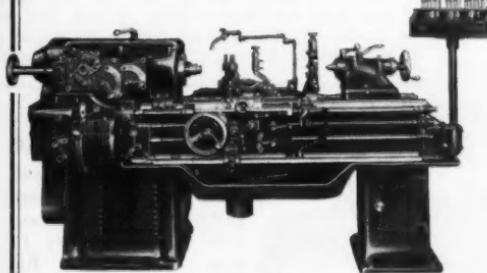
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job so much
quicker
and
better?**

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**DAVIS KEYSEATER CO.**

Exchange & Glasgow Sts.
ROCHESTER, N. Y.

SIDNEY
"PRECISION"
TOOL ROOM LATHE



THE SIDNEY MACHINE TOOL CO.
SIDNEY OHIO

... will give you new conceptions of modern accuracy and efficiency at greatly reduced costs.

Nothing has been spared in materials and workmanship to make this the finest precision lathe ever produced by SIDNEY.

We invite your most critical examination and investigation of the SIDNEY "Precision" Tool Room Lathe.

for removing the work from the lathe.

The diamond point can be transferred from the end to the side of the dresser, making it possible to dress the sides of the wheel as well as the face. The use of this dresser will make it possible to dress the wheel with precision accuracy.

"Down Grip" Machine Vise

The "Down Grip" Machine Vise formerly handled by C. R. Gier Company, 75 West St., New York, N. Y., and de-



Gier "Down Grip" Machine Vise

scribed in the September 1935 issue of MODERN MACHINE SHOP is now being marketed by Joseph Bauer, 200 Broadway, New York, N. Y.

The design of the "Down Grip" Machine Vise is such that the jaws exert an extremely powerful downward pull during the gripping operation, this object being achieved by the use of slides which carry the jaws. As pressure is applied to the jaws in gripping the work, a corresponding downward movement of the jaws, together with their slides, takes place. Consequently the tightening of the jaws on the work forces the work downward onto its seat which is either the base of the vise or parallels placed between the base and the work.

The vise can be supplied in four sizes in the plain type with one jaw stationary and the other working, swiveling type, or plain type with both jaws working. Either half of the vise can be supplied if required.

Beltpaco Junior Belting

A new transmission belt which fits into the field of light work has been announced by the New York Belting & Packing Company. The new belt, named Beltpaco Junior, takes its place with the four other high grade transmission belts in the N.Y.B.&P. line, namely: Test Special, Fortune, Beltpaco, and Great Seal Cord Endless.

Beltpaco Junior was particularly designed to take care of light or fractional horse-power drives; transmission drives characterized by light tensions, small pulleys and small bearings; small machine or machine tool drives; auxiliary drives in machines. It is also adapted for use as shaping or forming belts in machines processing materials where its functions are like special light conveyors.

The designers of Beltpaco Junior have added extra plies to give this new belt "body" and, at the same time, they have retained a flexibility which allows the belt to hug small pulleys and be elastic enough to eliminate any danger of overstraining bearings.

The extra plies and narrow construction make Beltpaco Junior better able to withstand machine over-loads and to avoid fastener trouble; also make it more rugged for shifting. As an auxiliary driver in a machine where additional thickness is needed to reduce stretching and where there is little or no take-up, Beltpaco Junior's extra plies provide a perfect answer.

Burke Motor Drive

The Burke Machine Tool Company, Conneaut, Ohio, has brought out a motor drive with which, by the use of a Vee Belt to the spindle, power can be applied to the Burke No. 1, 2, 3 and 4 Milling Machines. The low mounting of

EXTENSION BED GAP LATHE
24/48"-28/50" SWING ALL GEARED OR CONE HEAD

A lathe for small and large swing work. Long distance between centers. Three lathes in one. Saves space. Reduces cost.

Write for literature.

Cincinnati, Ohio

THE RAHN LARMON COMPANY



**No. 455
Angle Iron
Combination**

Shears, Notches and Bends a 2" x 2" x $\frac{1}{4}$ " angle iron in one minute flat.

Write for catalog on entire line.

**No. 20 BALL
BEARING
PUNCH**

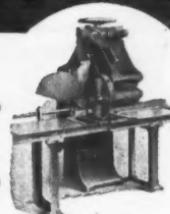
Capacity $\frac{1}{2}$ " thru $\frac{1}{2}$ " iron



WHITNEY METAL TOOL CO.

110 Forbes St.

Rockford, Ill.



"Oliver" Cut-Off Saw

FOR TUBES, MOULDINGS, STRIPS OF METAL
OR COMPOSITIONS

- Very Compact
- Straight or Angle Cuts
- Ball Bearings
- Extremely Accurate

**SAVES TIME,
SAVES SPACE, AND
SAVES YOU MONEY**

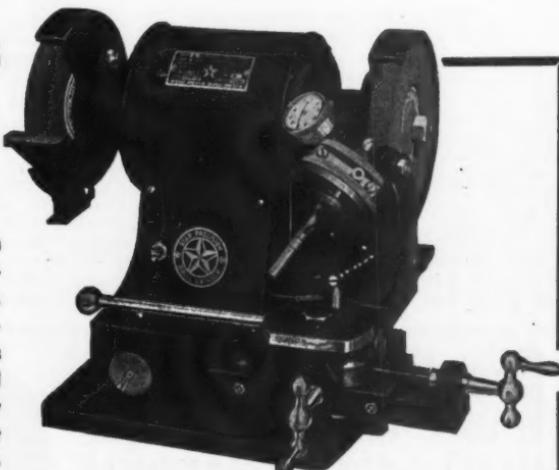
A mighty efficient production saw that makes straight or angle cuts of tubes and strips of metal, hard rubber or compositions. Self-contained, very compact. Operates lightly with no rebound. Well safeguarded. Cuts hundreds of pieces without variation of .005 inch. Ball bearings for long service and smooth operation.

Write for illustrated Bulletin

**OLIVER MACHINERY COMPANY
GRAND RAPIDS, MICHIGAN**

**Grinds
81 SIZES OF
Drills
No. 31 to $\frac{1}{2}$ "**

This Star Precision Grinder puts drill grinding on a production basis. Its simplicity and accuracy saves as high as 50% on drill costs and insures uniform accuracy that guarantees perfect holes and increases production.



Write for descriptive folder.

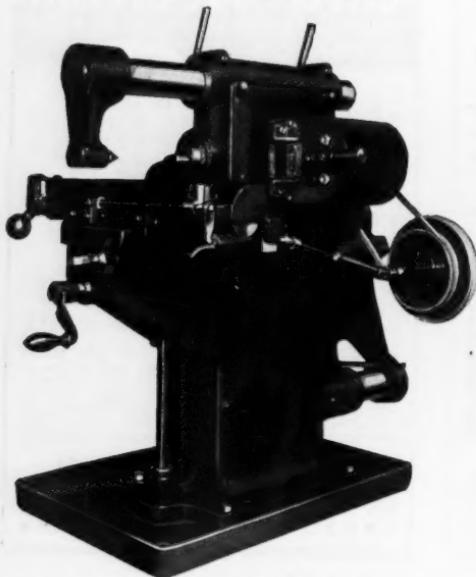
STAR MACHINE & ENGINEERING CORP.

Division of Star Electric Motor Co.
BLOOMFIELD AVE. BLOOMFIELD

NEW JERSEY

August, 1936

the motor reduces vibration to the minimum and the individual motor drive increases the efficiency of the machine.



Milling Machine Equipped with Burke Motor Drive

The convenient location of the reversing switch in connection with the heavy duty geared head motor provides for rapid handling of work on these machines, and all attachments manufactured for use with these machines can be used.

Armco Stabilized Steel

Full commercial production of "Armco Stabilized Steel" in cold rolled sheets and strip has been announced by The

American Rolling Mill Company, of Middletown, Ohio.

Stabilized steel is offered by the company as a uniform, deep-drawing and non-aging cold rolled steel with all stretcher strain permanently eliminated in the tempered condition. It retains indefinitely all of the properties of temper-rolled steel, making pre-fabrication treatments unnecessary, regardless of the length of time the metal has been in stock.

Unlike ordinary mild steels for deep drawing purposes, the new metal has no sharp yield point in the temper rolled condition. It is superior in resistance to cracking in some very severe drawing operations, and it will retain its initial excellent drawing properties indefinitely, the company claims.

In the general run of mild steel sheets, a sharp yield point develops within a comparatively short time after cold rolling, depending upon the aging temperatures to which they are subjected. It has been found that at 212 degrees Fahrenheit, the "yield point elongation" increases continuously and reaches a maximum after about two weeks at this temperature. The same changes occur at room temperature, but require days instead of minutes for their consummation.

Bristol Model 90 Controller

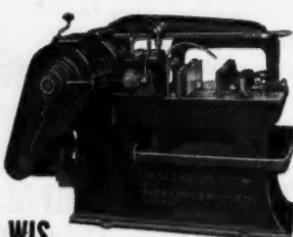
The illustration shows the Bristol Model 90 Pneumatic Type Controller for temperature, liquid level and pressure. This controller, product of The Bristol Company, Waterbury, Conn., has been developed to take care of many requirements for automatic temperature and pressure control that do not warrant a chart record of the controlled temperature or pressure. It is also intended for

RACINE

METAL CUTTING MACHINES

"Standard the World over"

RACINE TOOL AND MACHINE CO. • RACINE, WIS.



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detailed

RO
Borg-
old by

NEAT
STAMPING
IN
NAME PLATES



This machine quickly stamps details and serial numbers into name plates.

Write For Particulars

GEO. T. SCHMIDT, Inc.
1806 Belle Plaine Ave., Chicago, Ill.

**THE NEW
SHELDON 11" LATHE**



- 11½ in. Swing . . . Two bed lengths . . . 24 and 36 in. center distances . . . 1 1/16 in. Spindle Hole.

Semi-quick change gear box with gears for cutting 4 to 80 threads per inch.

Ask for Bulletin No. 23.

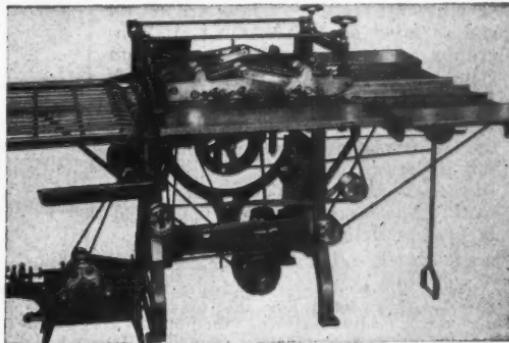
Sheldon Machine Co.

3253 Cottage Grove Ave.

CHICAGO, ILLINOIS

PULLMORE CLUTCHES "have what it takes"

One of the many different kinds of equipment in which Pullmore Clutches are used is the stripping machine illustrated. Machines of this kind are used in bookbinderies throughout the world. With this widespread distribution, reliability and durability are at a premium. The manufacturers of this machine write "We have used Pullmore Clutches for several years and have yet to find one that we have had to replace."—conclusive proof that Pullmore Clutches "have what it takes" for dependable clutch performance. They are compact, efficient, easily incorporated in machine designs. Write, today, for detailed information.



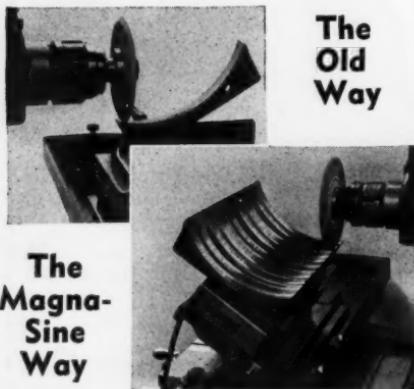
Pullmore Clutches are made in single and double types, for operation in oil or dry, in capacities up to 75 h.p.



ROCKFORD DRILLING MACHINE DIVISION

Borg-Warner Corporation 300 Catherine Street, Rockford, Illinois
sold by MORSE CHAIN CO., Ithaca, N. Y. With offices in principal cities

\$160 SAVED in FIVE DAYS



**The
Magna-
Sine
Way**

***THE JOB . . .** Serrating high speed jaws.

THE OLD METHOD . . . Jaws are set up individually and serrated one at a time. Average set-up and grinding time— $2\frac{1}{2}$ hours for one jaw.

THE NEW METHOD . . . Jaws are set up and serrated on the MAGNA-SINE in groups of ten. Average set-up and grinding time—3 HOURS FOR TEN JAWS.

THE RESULT . . . On this particular job, the MAGNA-SINE almost paid for itself in less than a week. The grinder was open in a short time for other work. The customer received unusually prompt delivery.

* This is an actual and recent example of MAGNA-SINE performance.

Write for full details of the time-saving, money-saving advantages of the MAGNA-SINE for work of this nature as well as for extremely accurate precision grinding work.

The Robbins

MAGNA-SINE

Manufactured by

Robbins Engineering Co.

637 Mt. Elliott Ave.

Detroit, Michigan

applications where recording instruments are already in use.

The Model 90 Controller is a small, compact instrument of simple construction, embodying the latest developments in modern automatic control apparatus. The outstanding feature of the controller is that it is equipped with a precision measuring element, which is of



Bristol Model 90 Controller

the same type as those used in Bristol recording instruments, where accuracy is of prime importance.

Alumaweld Flux

Of interest to Solder and Flux users everywhere is the new Flux developed by the Alumaweld Company of America, 2442 South Park Way, Chicago, Illinois. This new Flux used in conjunction with a special, high strength solder does a job heretofore considered impossible.

With Alumaweld Flux it is now possible to make high strength permanent repairs on joints of any metals, the Flux being applied with an ordinary soldering iron or blow torch. The soldering job is done at a low temperature but has the advantage of requiring high temperatures to melt it a second time. It works equally well on aluminum, stainless steel, die cast pot metals, cast iron

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CUT TOOL COSTS

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WILLEY'S

Tungsten Carbide Tipped Tools

You can depend on these tools for uniform high quality that really cuts tool costs! Complete stock guarantees immediate shipment.



SEND FOR CATALOG

containing full information.

ALSO

write for circular on improved type wheel dressing tool that will reduce your costs.

Willey's Carbide Tool Co.

1352 W. Vernor Highway

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Representatives in all principal cities.



MODERN MACHINE SHOP

147



Come to Hdqrs. for Industrial Counters

We measure the output of all types of metal working machines — punch presses, drill presses, screw machines, turret lathes, milling machines and many others. Send for bulletins on

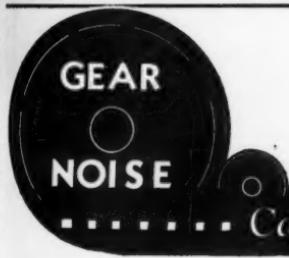
Productimeters

THE SPEEDOMETERS OF INDUSTRY

DURANT MFG. CO.

1932 N. Buffum St. 173 Eddy St.
Milwaukee, Wis. Providence, R. I.

TELL US WHAT YOU WANT TO COUNT



Paper Presented at the
Twentieth Annual Meeting
of the
American Gear Manufacturers Assn.
by W. E. Sykes

Causes and Corrections

In this informative paper the author explains the difference between noise and sound, states the causes of gear noise and analyzes the requirements of design, workmanship, lubrication and other factors that must be met to prevent or over-

come noise. The author has had over a quarter of a century of experience in the design, manufacture and operation of gearing and for a number of years has given much study to the subject discussed in the paper.



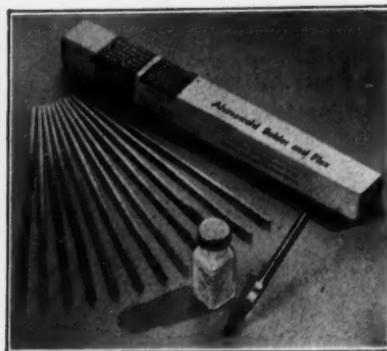
Demand for copies of this paper has required another printing. As long as this supply lasts we shall be glad to send a copy free to those who request it on their company letterhead.

FARREL-BIRMINGHAM COMPANY, INC.

381 Vulcan St., Buffalo, N. Y.

copper, brass, etc., which makes it easy to join any two different metals if desired. Alumaweld Flux works equally well with any type of solder.

Alumaweld Solder has a tensile



Alumaweld Solder and Flux Kit

strength of 12,000 pounds which is ten times that of ordinary solder. The finished joint can be worked or machined and takes a polish over which chromium

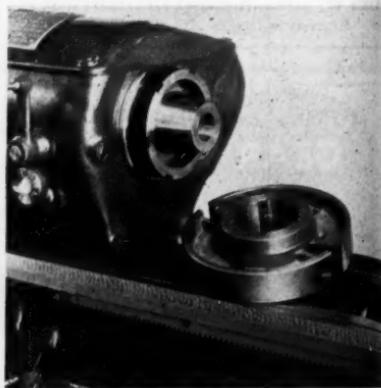
or any other plating can be applied.

Here are two new products that are finding many daily uses in Industry everywhere. Comes packed in low priced combination solder and flux kits with scratch cloth and instruction sheet or in Mechanics Kits and Shop Kits for large users. Alumaweld Flux is also obtainable packed in individual containers for use with any type solder.

Reed-Prentice Standard Lathe Spindle Nose

Reed-Prentice Corporation, Worcester, Mass., has announced a standard lathe spindle nose for its 14 and 16-in. Model AA sliding gear head engine lathes and Model B tool room lathes. The nose is said to permit more ready and accurate placement of chucks, faceplates, and so on.

Construction includes a long hardened taper bearing for alignment and a safety key for holding. The key permits plates or chucks to be hung on the spindle, thus allowing the operator to use both hands to start and tighten the

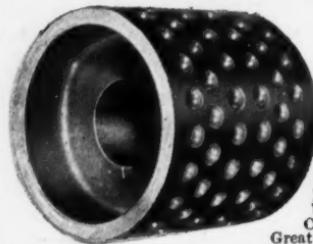


Reed-Prentice Standard Lathe Spindle Nose

collar. The key also brings the threads in the collar into immediate alignment with that on the faceplate or chuck readily and without difficulty. A face plate or chuck can be taken off or put on in from 12 to 15 seconds.

The construction is said to provide the following features: greater accuracy and longer life; low chucking inventory through interchangeability; labor saving through simple mounting; utmost safety; accessibility for cleaning.

STOP BELT SLIPPING!



Pat'd
U. S.
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Great Britain

VACUUM CUP METAL PULLEYS

Guaranteed to: Eliminate belt slippage and power loss . . . increase life of belts and equipment . . . wear indefinitely . . . keep belts from flying off . . . give many other money saving advantages.

Order now on 30 DAY FREE TRIAL OFFER. Used in many of the largest plants.

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Explosion Proof

motors may be moved without disturbing underwriters label.



BRAD FOOTE MOTORIZED SPEED REDUCER

Patented feature in all sizes and styles. Oil cannot enter the motor from reducer housing. Write for new 128 page book of useful data FREE. Ask for book No. 6.

FOOTE GEAR WORKS, INC.

1301 E. CICERO AV., CICERO, ILLINOIS

PRECISION BUILT High Speed MILLING ATTACHMENTS

The versatility, productive capacity and economy of Bridgeport High Speed Milling Attachments enable them to pay for themselves in a very short time. In use in both small and large plants throughout the United States and Canada. An investment you will be glad you made. Adapters available for all types of machines.

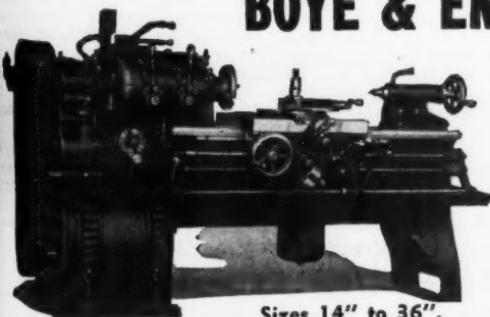
Write for complete details and prices.



BRIDGEPORT PATTERN & MODEL WORKS

52 REMER STREET
BRIDGEPORT CONN.

Smooth - Powerful - Accurate BOYE & EMMES LATHES



Sizes 14" to 36".

BOYE & EMMES Lathes will deliver the finest kind of lathe performance you've ever known, and they'll keep on delivering year after year. That's the result of experienced engineering . . . quality construction . . . and strict attention to every detail.

Write today for complete information.

THE BOYE & EMMES MACHINE TOOL CO.
CINCINNATI

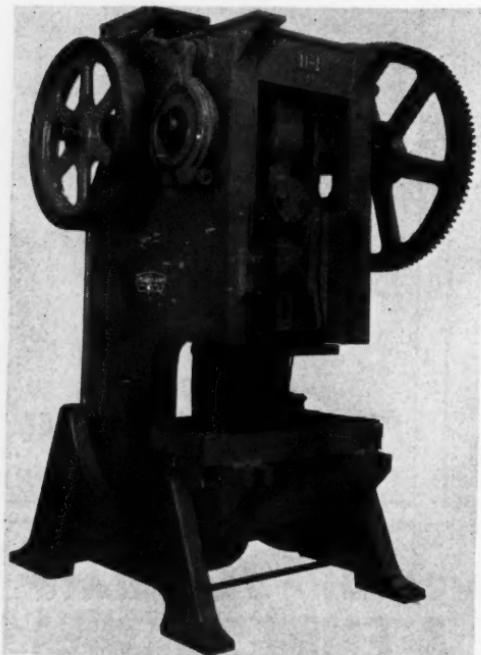
OHIO



"The Lathe With The Longer Life"

Cleveland No. 11-I Inclinable Press

The illustration shows an all welded steel frame inclinable press which has been brought out by The Cleveland



Cleveland No. 11-I Inclinable Press

Punch & Shear Works, 3917 St. Claire St., Cleveland, Ohio. The all welded steel frame is designed with box section housings which not only insure maximum rigidity with minimum weight, but also reduce "weaving" to a mini-

mum. Any stresses which exist in the frame after welding are relieved.

The press, which is of the single-gear type arranged for direct-connected motor drive, has a capacity of approximately 115 tons and operates at a speed of 40 strokes per minute. The bed area is 29 in. front to back and 40 in. side to side. The design includes a block type clutch and an extra large brake which is provided with a safety drop bar.

The driveshaft is mounted on roller bearings and a slide, which has extra long bearing surfaces, is provided with a new style two-piece connection. This type of construction is not confined to this particular size of inclinable press, but can also be used for inclinable presses of medium size.

"Aspro" Metal Finishes

A new type of metal finish with a modified asphalt base has just been introduced by The Asphalt Products Company, Inc., Grand Central Terminal, New York City. It has unusual properties that recommend it particularly for machinery finishing.

The new product is available in a variety of colors known as "Aspro Metal Finishes". The finishes are insoluble in oil and the lighter distillates of petroleum, and are not affected by cutting compounds, soap and other alkaline solutions. They show strong resistance to the acids most commonly used commercially and to the effects of water, sunlight and weathering. They may be obtained in black and the darker shades of brown, gray, red and green.

The new finishes are applied by spray gun or brush and may be baked or air-dried. They dry to the touch in four



**MALL FLEXIBLE SHAFT MACHINES
"REAL PORTABLE GRINDERS"**

for Grinding, Rust Removing, Polishing, Sanding
and a multitude of other applications.

A size and type for **EVERY** metal working requirement.
A **MALL** in your shop will cut costs and step up production!

Write for literature . . . and let us advise you regarding the proper
MALL unit for **YOUR** work.

MALL TOOL COMPANY
7739 South Chicago Avenue

Chicago, Illinois

UNIVERSAL COLLET CHUCKS

GRIP AS STRONG

AS

SOLID
STEEL

CONCENTRIC
WITHIN
.001

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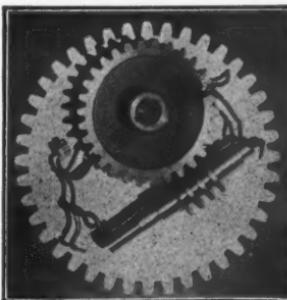
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MILLS

KEY WAY
CUTTERS

AND NITRIDED
CENTER POINTS



UNIVERSAL
ENGINEERING CO.
FRANKENMUTH, MICH.



"They Live on the Job"

Mass. Gears

Good in appearance
Good in quality and
Good for repeat orders

All Types and Materials.

Massachusetts Gear & Tool Co.
27 Nashua St. Woburn, Mass.

THIS EXPERIENCE IS TYPICAL OF CUMBERLAND PERFORMANCE:

"We have been using Cumberland Turned and Ground Shafting for a period in excess of twenty-five years, and have always found it to be very satisfactory."

"We standardize on Cumberland Shafting because of its consistent uniformity in size and finish."



Send for your copy of our new folder . . . it contains much useful data for the shaft buyer.

"86 YEARS IN BUSINESS"

CUMBERLAND STEEL COMPANY
CUMBERLAND, MARYLAND

TOLERANCES

SPECIAL
(Any Diameter)
LIMITS $\pm 0.0005"$
or any other total
tolerance of $0.001"$

STANDARD

Small Dia. { $+0.000"$

{ $-0.002"$

Large Dia. { $+0.000"$

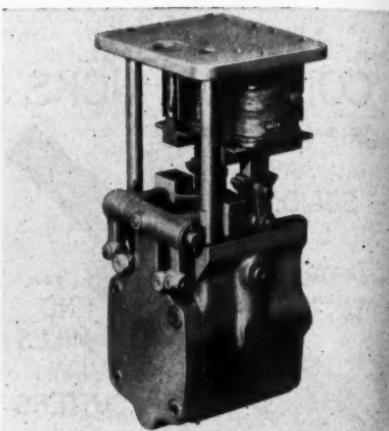
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hours and attain maximum hardness within twenty-four hours. The surface has a lustre similar to that of glossy enamel and is harder than that of other asphalt base finishes, yet its resiliency is sufficient to prevent peeling, checking and cracking. Aspro Finishes have excellent adhesion and hiding power and a high degree of elasticity that permits expansion and contraction with changes in temperature.

Besides machinery finishing, the new products have qualities that recommend for many applications in shipping and railroad fields. As they are non-fire-supporting, they should be of great value to ship-owners, especially under the more stringent safety regulations now enforced.

Oilgear Remote Controller for Fluid Power Feeds

The Oilgear Company, 1319 W. Bruce St., Milwaukee, Wis., announces a remote controller for New Series Fluid Power Feeds. The features of the feed are the simple and compact design, elimination of mechanical control devices, and the simplicity of operation. Hydraulic and electrical devices have been conveniently

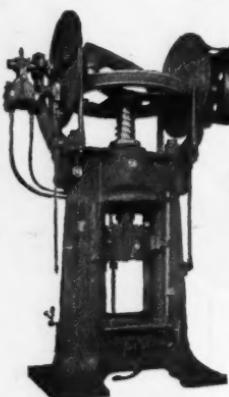


Oilgear Remote Controller for Fluid Power Feeds

and effectively combined so that machines can easily be controlled from a remote point.

New and rebuilt machines can easily be equipped with Fluid Power Feeds when using the combined remote controller. The pump with remote controller can be mounted in a remote condition convenient to the power source and feed cylinder without complicating the control mechanism.

PATENT PERCUSSION POWER PRESSES



**Excellent
for
Coining!
Embossing!
Hot and
Cold
Pressing
Of Metals!**

Manufactured by

Zeh & Hahnemann Co.
184 Vanderpool St., Newark, N. J.

Kelly Serrated Tools

Simplicity of design, rapid adjustment for regrinding and long, economical blade life are said to be the features of the new serrated tools which have been brought out by The Kelly Reamer Co. 3773 Ridge Rd., Cleveland, Ohio. The tool has but three component parts; the body, blades and wedges. No screws, pins, collars, shims or other devices are used in its construction. The body is of alloy steel, carburized, hardened and drawn. The blades may be supplied in cobalt high speed steel, stellite J metal or cemented carbide types. The wedges are of heat treated alloy steel.

Serrations, tapered longitudinally, are cut into the side of each slot in the body of the tool. These serrations are also slightly convergent to the axis of the cutter body. The rear surface of each blade is serrated longitudinally for engagement with the serrations in the slot and the front side of the blade is

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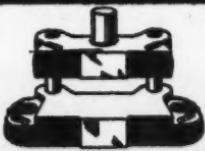
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SPECIAL TOOLS**



THE STANDARD TOOL CO.

CLEVELAND, OHIO

New York Detroit Chicago

equipped with radial serrations for engagement with matching serrations on the wedge. The two parts are thus held in selectively fixed relation. While held in this position, they are inserted into the slot opening in which they are driven to a tight seat. The blades are securely held against any radial movement by

one or more serrations on the wedge engagement and, by means of the inclined longitudinal serrations in the slot, accomplish a radial movement of about 0.004 in. per blade or about 0.008 in. on the diameter for each tooth adjustment so made. This applies to all blades except No. 605, the radial movement for this blade being about 0.0025 in. per tooth adjustment or 0.005 in. on the diameter.

Reamer heads are available in diameters of from $1\frac{1}{2}$ to 6 in., which are from $2\frac{15}{16}$ to $4\frac{1}{2}$ in. long. The standard bore of the large end ranges from $\frac{1}{2}$ -in. to $2\frac{1}{2}$ -in. diameter. For finishing, the $1\frac{1}{2}$ -in. tool has 6 blades and the 6-in. tool has 12 blades. For roughing, the $1\frac{1}{2}$ -in. reamer has 4 blades and the 6-in. reamer has 8 blades.

Standard roughers have right hand angle, right hand blades. Standard finishers have left hand angle, right hand blades.

Special types to order.

Kelly Serrated Tools

the engagement of the longitudinal serrations on the blade and body and the radial serrations on the blade, being engaged with corresponding serrations on the tapered wedge, prevent endwise movement.

To expand the blades radially an amount less than the pitch of one serration, the blade may be moved forward

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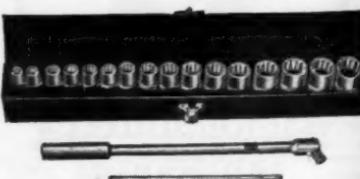
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Write for descriptive Price list. Send dime for sample handle. Steel lined — super service — 10 styles.

Bonney No. D3 Socket Set

Known as the No. D3 Socket Set, the Bonney Forge and Tool Works, Allentown, Pa., has placed on the market a wrench set consisting of 16 sockets with double-hexagon openings ranging from $7/16$ to $1\frac{1}{4}$ in. square drive. Supplied



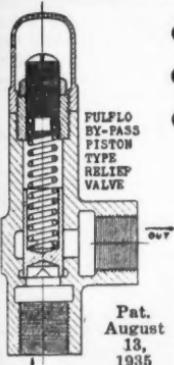
Bonney No. D3 Socket Set

with the sockets is a hinge handle 15 in. long, with cross handle.

The entire set is made of Bonney "CV" Chrome-Vanadium steel to withstand the most severe use. Each piece is chrome-plated and polished to a high, permanent lustre. All parts are packed in a substantial metal case measuring $20\frac{1}{2} \times 3\frac{3}{4} \times 2$ in. and finished in black. The net weight is $8\frac{1}{2}$ pounds.



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Pat. August 13, 1935

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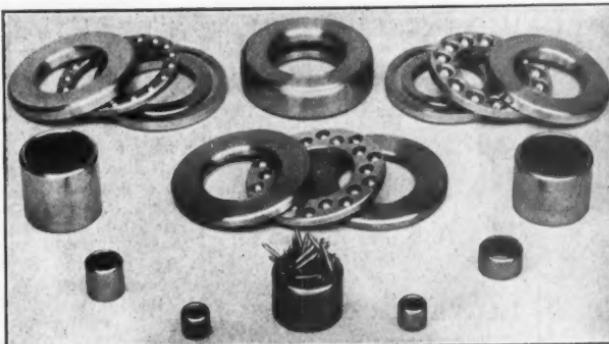
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R and L Turning Tool

A combination tool which can be used for right or left hand turning or can be used in combination with a drill for turning and drilling together, designed for use in a turret, has been brought out by R and L Tools, Poorman St., Nicetown, Philadelphia, Pa. The turning and drilling combination is said to be a distinct advantage on multiple spindle machines where lack of sufficient number of positions sometimes necessitates extra operations to complete the piece.

The tool is made in two sizes—No. 1 and No. 2. The No. 1 is equipped



R and L Turning Tool

with a shank $\frac{3}{4} \times 2$ in. long and will turn up to $\frac{1}{2}$ in. diameter $\times \frac{2}{3}$ in. long if not used with the drill. If the drill is used, it will turn $1\frac{1}{2}$ in. long. The No. 2 tool has a shank 1 in. diameter $\times 2$ in. long and will turn to $\frac{3}{4}$ in. diameter $\times \frac{2}{3}$ in. long if not used with the drill or will turn $1\frac{1}{2}$ in. long with the drill. The floating construction allows the drill to be centered accurately.

The tool uses toolbits of standard size and the bits are mounted so that they are ground only on the top side or end. Due to the shape of the tool, less cross slide clearance is required, which not only saves time but in many cases permits work to be done with cross slide tools while the piece is being turned. The tool may be used for roughing or finishing cuts, either right or left hand, and can be changed from one to another in 10 seconds. The extreme hard surfaces of the tantalum carbide backrests, or burnishers, make it impossible to mar the surface of the work. There

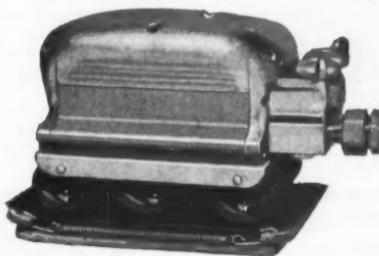
are no rollers or roller shafts to wear, thus no misalignment of the rolls with the work is possible. Extremely fine adjustment is provided on both the tool and the pressure of the burnishers. By replacing the burnishers with extra tool holders, which are furnished with each tool, it is readily converted into a balanced turning tool with two cutting edges. Thus a cut can be divided between the two tools for quick removal of stock. Shanks are furnished to fit any machine.

Improvements in Sterling Speed-Bloc Sander

Major improvements have been made which have greatly increased the usefulness of the Speed-Bloc Sander, made by Sterling Products Co., Curtis Bldg., Detroit, Mich. Designed primarily to replace hand sanding and rubbing, the application of the sander has been increased considerably. The sander is now applicable to more curved and all flat surfaces on all sorts of fabrics and products.

The floating principle has been applied to the block and pad, resulting in an entirely new motion in which all restriction of the movement of the pad

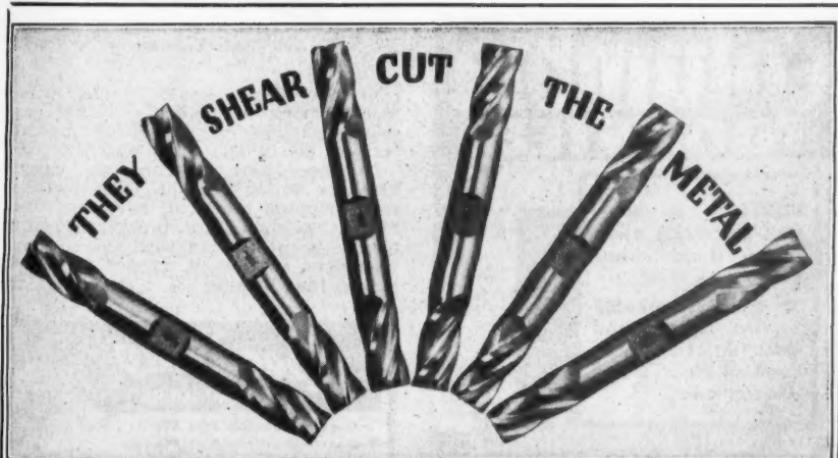
proper is eliminated. Using highly flexible tubular rollers of special rubber composition between the pad and the air motor, the contact of the abrasive surface has been increased to approximately 90 per cent. A proportionate in-



Sterling Improved Speed-Bloc Sander

crease in effective abrasive area also applies to curved surfaces.

The sanding block is now made of five parts and the parts are readily replaced when worn. A hardened steel shoe which receives the thrust is now localized integrally with the rubber block instead of being held by screws.



New Catalog just off the press, showing single and double end mills, die sinking cutters, center drills, jig boring end mills, and holders. Send for your catalog.

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MICHIGAN

Improvements in the air motor have given it smoother operation and decreased the air consumption. Full operation is obtained with from 50 to 60 lbs. of air and delivery of power at maximum of torque has been measurably increased, yet air consumption is still within limits of slightly over 6 cu. ft. per minute.

Pistons are given "anodic" treatment and leather piston cups are ingeniously mounted to permit renewal without removing the piston. Cross head and driving shaft are in one piece of alloy steel. Double shielded ball bearings are

used throughout. The motor exhaust is equipped with a silencer which reduces vibration. The oscillating stroke of the pad is $\frac{1}{8}$ in. and the speed remains at 3000 strokes per minute. The sander is 7 in. long, $4\frac{1}{4}$ in. high, and $3\frac{3}{4}$ in. wide. Weight, $7\frac{1}{2}$ pounds.

G-E Combination Magnetic Switch

with maximum ratings of 25 horsepower at 220 volts and 50 horsepower at 440 volts to 600 volts parallels—but does not

EVERY SHOP needs these rugged, accurate portable Pyrometers. L88 for checking Surface Temperature: 800° range with 1 ft. silver tip couple, \$17.90. L89 for Non-ferrous Metals: 1600° range with 2 ft. couple and 1 ft. replaceable tip, \$19.30. L90 for Furnaces: 2500° range with 3 ft. couple, \$19.00. Sent on 30-Day Trial. Circular Free.

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G-E Combination Magnetic Switch

supersede—a G-E line of similar ratings incorporating a magnetic switch with overload relays for motor running protection, all in the same enclosing case.

In these new switches, air current breakers which can be reset by hand after tripping are used instead of fused safety switches. The breaker operating handle is interlocked with the enclosing case door so that it cannot be opened when the breaker is closed and the

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breaker can be locked either open or closed from the outside of the case.

Wrought Washer Mfg. Co. Non-Ferrous Expansion Plugs

The Wrought Washer Mfg. Co., E. Bay St., Milwaukee, Wis., announces the introduction of a complete line of non-ferrous expansion plugs covering the range of metals in demand in most com-

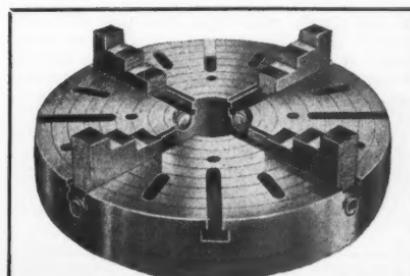


Wrought-Washer Mfg. Co. Non-Ferrous Expansion Plugs

mon use today including brass, copper, stainless steel, aluminum, monel metal, and so on. A demand for non-ferrous expansion plugs for special applications has been developed as a result of the more complicated manufacturing processes in use in modern manufacturing and this line of non-ferrous expansion plugs is intended to meet this need. The plugs are available in any size and dimension required by the user.

Amsco "Double-Wall" Crane Wheels

The illustration shows the Amsco "Double-Wall" Crane Wheel which has been placed on the market by the American Manganese Steel Company, Chicago Heights, Ill. Although usually designed



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SAMPSON "STEEL ALLOY" CHUCKS are available for immediate delivery from stock.

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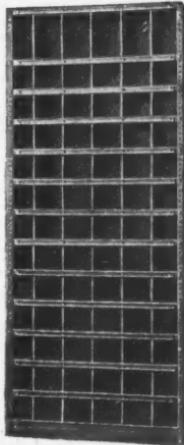
UNIT No. 28

(at right)

Size: 36" wide, 12" deep, 7' 3" high.
Number of bins 6—
6" w., 12" h., 12" d.; 72—6" w., 9" h.,
12" d. Green enameled Finish.

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Parent Metal Products, Inc.
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in the single web type, the use of manganese steel for crane wheels has provided a tough, ductile, work-hardening surface which has largely insured against rapid wear, surface cracking, and flat spots on the treads. To these advantages has been added that of the added strength afforded by double wall construction, as shown in the illustration.

The walls of the Amsco "Double-Wall"

BREUER'S BALL BEARING TORNADO PORTABLE ELECTRIC BLOWER

BLOWS powerful 275 M.P.H. blast of air into motors and machines. Drives out dust and dirt. Prevents fire, friction, burnouts and shut-downs. **VACUUM** cleans stock bins, shelves, overhead pipes, walls, rugs, etc. **SPRAYS** insecticides. 1 H.P. motor. Most powerful blower built — 46 1/4" waterlift.

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843 Blackhawk St., Chicago, Ill.



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No Leveling Required

A simple and excellent device for balancing straightening and trueing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000

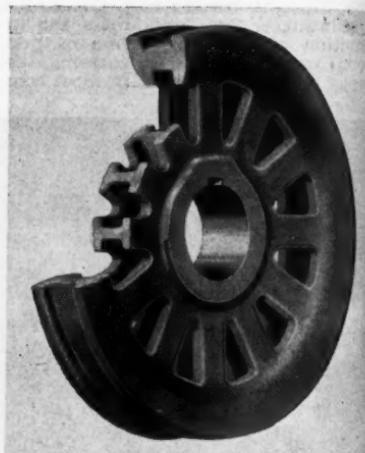
Four chilled iron discs rotate on sensitive special bearings



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Mfd. By **Anderson Bros. Mfg. Co.**
1926 Kishwaukee St., Rockford, Ill.

wheels are continuous with the flange, giving them a strong but elastic support and high resistance to side thrusts. The walls are integrally tied together with internal cross spokes. Metal sec-



Amsco "Double-Wall" Crane Wheel

tions are equalized, making possible, in manganese steel foundry practice, a perfect heat treatment which results in maximum toughness in the steel.

The inherent structural strength of the design, combined with the toughness, strength, and wear resistance of manganese steel, are said to make the wheel highly economical in service and particularly under the most severe conditions. Amsco Double-Wall Manganese Steel Crane Wheels are made in all diameters, for all cranes, with dimensions optional. A dimension and data sheet is available to those interested.

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6538 Carnegie Ave., Cleveland

Cutler-Hammer Small Drum Switch

Small size, a simple, sturdy mechanism and high capacity rating are features of a new drum type reversing switch developed by Cutler-Hammer, Inc., 429 N. 12th St., Milwaukee, Wis. This new switch, known as Bulletin 9441, type VI, is of the across-the-line type, with "Twin-break" contacts and moulded arc barriers to give it an exceptionally high rating and long life. It can be furnished in either a standard enclosure or as a skeleton drum with mounting plate for "built-in" applications on machines.

All arcing parts are designed to give long wear and to be easily renewed. Movable contacts are easily and quickly removed, without the use of any tools. The stationary contacts are assembled into an inexpensive moulded base, so that when they require renewal, the entire base is replaced by simply removing three screws.

The drum switch is applicable to almost any type of single phase, polyphase or D. C. motors. It can also be used as a three pole, double throw switch by removing the jumpers. Ratings are: for single phase, 1 h.p., 110 volts, $1\frac{1}{2}$ h.p., 220 volts—for polyphase, $1\frac{1}{2}$ h.p., 110 volts, 2 h.p., 220, 440 or 550 volts—for D.C. 1 h.p., 115 or 230 volts.

Its nominal eight hour rating is 15 amperes.

Laminum Arbor Spacers

Arbor spacers in thicknesses from 0.001 in. to 0.020 in. and six arbor sizes, packed 10 to an envelope, are now available from the Laminated Shim Company 21-24 44th Ave., Long Island City, N. Y.



Laminum Arbor Spacers

N. Y. The envelopes are waterproof, preventing damaging and wasting of thin spacers in handling. Sizes are clearly marked at the top of the envelope, saving the necessity of hunting for size



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BRONZE BUSHINGS • BEARINGS
MACHINED AND CENTERED BRONZE BARS
ANTI-FRICTION METAL

and thickness required. The spacers are also packed 20 to an envelope in assorted thicknesses.

Sundstrand Rota-Roll Hydraulic Pump

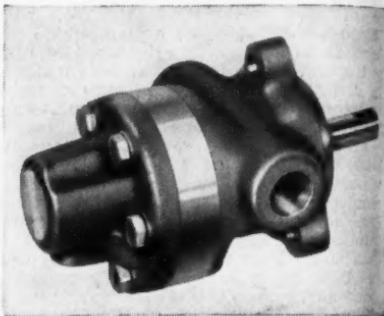
A small capacity, high pressure, rotary pump with positive displacement has been introduced by the Sundstrand Machine Tool Company, Rockford, Illinois, being an addition to their line of Rota-Roll Pumps. The new pump is designed for pumping water at high pressures as well as oil and other fluids.

The pumping members consist of a rotor and roller which revolve with each other in a manner similar to a single roller rolling with the outer race of a roller bearing, an arrangement that assures long life with extremely low power consumption.

The design of the pump incorporates a new feature whereby all of the revolving parts are mounted in roller or needle bearings, which greatly increases the mechanical efficiency. High volumetric efficiency is also developed due to the self-emptying feature of the pumping members and to a mechanism so de-

signed that there is very little chance for slippage.

The pump has few parts and is small and compact with a hub and flange on the body for flange mounting or for attaching a foot for foot mounting.



Sundstrand "Rota-Roll" Hydraulic Pump

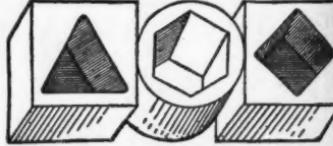
Other features are quiet operation with smooth uniform flow as well as high suction. The pump is built to run at motor speeds and at present is available



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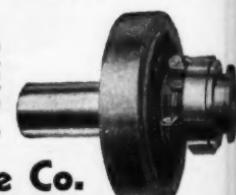
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DISC "TYPE SF"

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The Edgemont Machine Co.
2100 HOME AVE.

FRICITION CLUTCHES



in two sizes, the capacities being one and two gallons per minutes at 1725 r. p. m.

Design of Aladdin Arc Welder Involves New Principle

Designed to provide efficient arc welding facilities at a minimum initial investment, the Commonwealth Manufacturing Corporation, Dept. J-66, 3785 Beechmont Ave., Cincinnati, Ohio, has developed the arc welder illustrated herewith. It is said that the design of this welder—to be known as the "Aladdin"—involves a revolutionary new prin-



Aladdin Arc Welder

ciple, which, while comparatively simple, is highly efficient.

The machine is stated to be very powerful, and will weld all weldable metals and alloys and will also braze and solder. Sturdily constructed, it is capable of handling all kinds of welding jobs from motor blocks and heavy castings to fenders and light sheet metal. The machine can be operated on either 110 or 220 volt, 50 or 60 cycle, alternating current and is said to cost but a few cents an hour to operate. The machine weighs 100 pounds. All materials used in the construction of the welder have been carefully selected for the purpose.

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Have acid fumes, humid air or other similar conditions caused part of your production to rust? Unless corrosion is far advanced you can reclaim even threaded and other closely machined parts . . . safely . . . thoroughly. A short immersion in Oakite Compound No. 32 removes rust and rust films . . . and does it without any injurious effects on the underlying sound metals.

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And . . . for future protection, use Oakite Anti-Rust, a thin, non-greasy coating easy to apply . . . low in cost. Extremely effective for parts to be carried in stock or between operations, Oakite Anti-Rust is readily removed whenever desirable. Tell us your rust removing or rust prevention troubles. We can help. Write today.

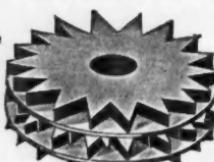
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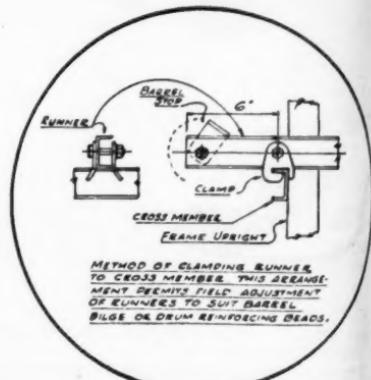
• U. S. Multiple Drill Head Units quickly convert any single spindle drill into a multiple unit. Thus, you are assured more holes per minute and larger profits.

Send blue prints for estimates.

The United States Drill Head Co.
1954 Riverside Drive
CINCINNATI, OHIO

Barrett Barrel Rack

The engineers of the Barrett-Craven Company, 3257 West Thirtieth St., Chicago, Ill., have designed a rail clip that permits adjustment of barrel runners so that any type of drum or barrel may be stored in a standard storage rack. By using these clips, adjustment is possible



Barrett Barrel Rack

and it is not necessary to weaken the cross braces by punching holes in them. The barrel runners can be moved in or out to conform to the type of container being handled.

Another feature in the Barrett Barrel Rack is the tie-rod, which is so designed as to assure stronger racks due to the

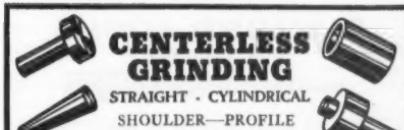
fact that no holes are punched in the uprights. In addition, the design properly places the tie-rods at the extreme top and bottom, where tightening should and best can be done.

Goodrich Vibro-Insulators

The B. F. Goodrich Company, Akron, Ohio, announces a new standard line of vibration damping rubber-to-metal mountings, known as "Vibro-Insulators," which are designed for bases of machines, electric and combustion motors, generators, vibrating screens and reciprocating mechanisms.

The mountings are of the shear type, consisting of a highly age-resisting rubber bonded to two metal plates, one of which is fastened to the vibrating member and the other to the support or foundation. The rubber is attached to the metal plates with a brass plating type of bond which gives an adhesion of 200 lbs. per square inch.

Vibro-Insulators are stocked in three types. Type No. 1 has a maximum load capacity of 800 lbs. and a minimum frequency of 800 vibrations per minute. Type No. 2 will support a maximum load



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STRAIGHT - CYLINDRICAL
SHOULDER - PROFILE
AND DOUBLE DIAMETERS

All Kinds of Materials

SCREW MACHINE PRODUCTS, HEAT-TREATED AND GROUNDED, IF NECESSARY
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PORTER MACHINE COMPANY
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LINLEY NOISELESS ROTARY RIVETING MACHINES

Assure Peak Production and Lower Maintenance. Rigid and Powerful. Bench and Floor Types. Motor or Belt Driven. There is a Linley machine for every riveting job.

Send Samples of your Work and we will furnish accurate estimate of production and quote cost of equipment.

LINLEY BROTHERS CO.
583 Fairfield Avenue
Bridgeport, Conn., U. S. A.



NEW TAPPING ATTACHMENT WITH THE NEW "TRU-GRIP" TAP HOLDER

Now a finer high speed tapping attachment is available for your drill press. The new "Procunier" Style "Tru-Grip" tapper has the latest improvement in high speed tapping. Its kind, ground for greatest accuracy, sturdy, easy to operate. Send for new literature.

PROCUNIER
SAFETY CHUCK COMPANY
12 So. Clinton St. Chicago, U. S. A.

DIAMOND TOOLS FOR ECONOMY



All types for dressing grinding wheels. Sharp Diamond Tools, etc. Large stock unset stones on hand. Resetting and resharpenings returned same day received.

Send for price list and specify your requirements.

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Established 1862
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M-D Facing Heads

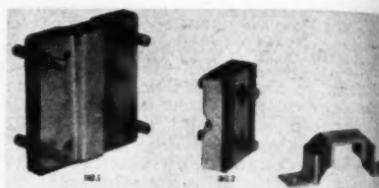
With Automatic Feed

Can be attached to Column Boring Bar, and Drilling or Milling Machine spindles. Single point tool travels radially, from center outward or reverse, feeds automatically, and covers faces 6° to 30°.

Write for circular.

MUMMERT-DIXON CO.
120 Philadelphia St. Hanover, Pa.

of 200 lbs. and has a minimum frequency of 1200 vibrations per minute. Type No. 10, which is of the double shear type, has a minimum frequency of 1000

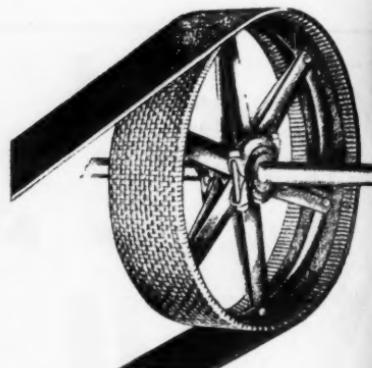


Goodrich Vibro-Insulators

vibrations per minute and is available in a range of sizes for loads of 50 to 3000 lbs.

Contrastit Belt Pulley Bandage

Scann-American Sales Service, 200 Broadway, New York, N. Y., is now marketing Contrastit Belt Pulley Bandages. All of the various evils due to slipping of belts are claimed to be conquered by



Contrastit Belt Pulley Bandage

the use of Contrastit Belt Pulley Bandages, permitting operation with slack belts, insuring an even pull, and eliminating necessity for belt dressings. The Contrastit Bandage can be used on wood, iron, steel or other pulleys and are said to be unaffected by heat, cold, steam, oil and so on. According to the distributor, Contrastit Bandages are easily applied and extremely long lived.

Gear DATA!
Write for it

WALDRON
SILENT
STEEL

Gears

WRITE DEPT. "M"
JOHN WALDRON CORPORATION
New Brunswick, New Jersey

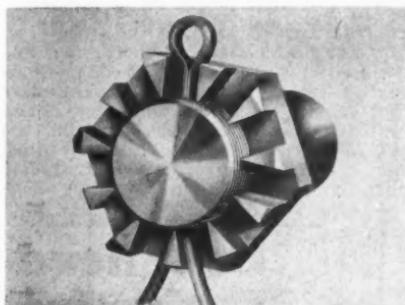
Norma-Hoffmann Sealed Precision Bearings Packed With Stability-Tested Grease

The Norma-Hoffmann Bearings Corporation, Stamford, Conn., announces that its wholly-enclosed, sealed Precision bearings are now being packed with a grease that has been pre-tested for maximum stability and, as a precaution against the effects of grease oxidation, are being wrapped in aluminum foil. This method of testing greases and packaging the bearings is a result of research with a view to safeguarding bearing users against the difficulties resulting from the oxidation and premature hardening of ordinary greases.

Cooke Micro Slotted Nut

The Blatchford Corporation, 80 East Jackson Blvd., Chicago, Ill., is now marketing the Cooke Micro Slotted Nut shown in the illustration. From 10 to 22 adjustments are possible per turn of the nut (depending on size) instead of the usual 6 per turn afforded by the usual 6 slots in the ordinary castellated nut. This micromatic adjustment is achieved by locating the keying wedges

off center from one another so that two keying positions are possible for each slot. Because of this closer adjustment, there never is an occasion for backing off the nut in order to get a key through



Cooke Micro Slotted Nut

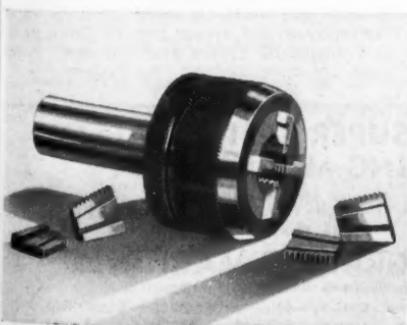
the hole, or of tightening with shims.

The key is set by simply tapping it in with a hammer, no pliers being needed. The key spreads automatically, curving outward and filling the space between the wedge and the sides of the

NEW . . . SOLID ADJUSTABLE DIE HEAD AND HOLLOW MILL

COMPACT — ACCURATE — STURDY

Adjustable to fractions of a .001 in.



Simple—only three parts with chaser adjustment to a fraction of a .001 in. providing longer cutter life. Made for any range of thread cutting from 0 up. The $\frac{3}{8}$ " A. S. Die Head illustrated. These Die Heads can be used for Hollow Milling. Here is a precision tool that skilled hands will appreciate. Write for information.

RICKERT-SHAFER CO., 1116 CHERRY-ERIE, PA.

hole. A special key accompanies each nut. The end of the key is trimmed off to an internal V-shape so that it spreads readily around the keying wedge on the nut.

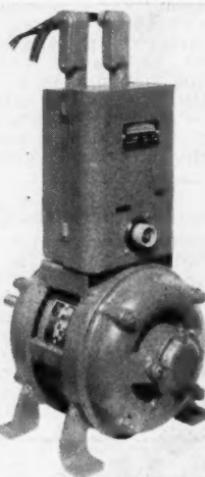
Lincoln Self-Protected Motor

A motor which cannot burn out is announced by The Lincoln Electric Company, Cleveland, Ohio. This revolutionary type of motor has a protective device built into the windings. Should the motor be stalled through overloading, should it become excessively hot due to poor ventilation, should it run on single

phase, or if for any other reason the motor is blocked the protector shuts off the current and the motor is saved from damage.

With a self-protected motor, less supervision of motors is necessary, repair bills are cut, and frequently smaller size motors can be used according to the

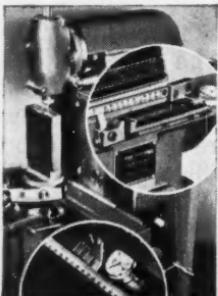
SCHAUER MACHINE CO.
905-7 Broadway
Cincinnati, Ohio



Lincoln Self-Protected Motor

manufacturer. Where large motors are necessary to take care of only infrequent peak loads, a small size self-protected motor may be employed. At the high peak loads the protector will automatically disconnect the motor.

A.C. induction self-protected Lincoln motors are built in sizes from $\frac{1}{2}$ to 30 horsepower, for either two or three phase and standard cycles and voltages. Controls are mounted on the motors.



DECKEL SUPER UNIVERSALITY MILLING MACHINE FPI

Vertical, Horizontal, Angular Milling—Boring—Counter Boring—Facing—Drilling—Slotting—High Speed Profiling—Routing.
All in One Setup.

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(High Speed 3 and 2 Dimensional)
Die Sinking—Mold Cutting—Milling—Profiling—Engraving.

H. P. Preis Engraving Machine Co.
155-159 Summit St.
Newark, N. J.

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"Thinweld" Coated Electrodes

"Thinweld" electrodes—specially coated electrodes for arc welding light gauge sheet metal—are now being offered in 1/16, 3/32 and 1/8 in. size by the Hobart Brothers Company, Troy, Ohio. The "Thinweld" electrodes are especially adaptable for use on the 75 and 100 ampere Hobart Simplified Arc Welding Machines. It is said that metal as light as 24 and 26 gauge is being successfully arc welded with the Hobart Simplified Arc Welding Machine and "Thinweld" electrodes.



Morse Barrel and Drum Cradle Truck

Heavy drums or barrels can easily be handled with the Morse Barrel and Drum Cradle Truck shown in the illustration, product of Morse Mfg. Co., Inc., Syracuse, N. Y. This truck is designed for ease in handling heavy drums, the curve of the rocker being developed to provide the maximum of leverage at all points, the height being suitable for use with the highest five-gallon cans, and liberal size rollers being provided for

quick and easy handling of barrels, drums, and similar units.

The truck is constructed of strong angle steel, each side being a continuous piece with corners double and riveted. The malleable iron nose piece is designed for strength and to a suitable shape to accommodate all sizes of barrels and drums. The weight of the truck is 25 lbs.

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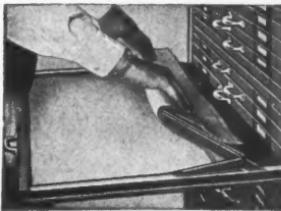
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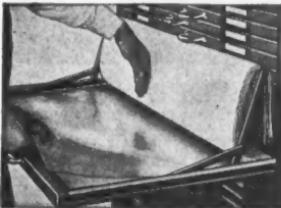
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Selecting sheet with Tracing Lifter and removing sheet without strain.



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Drafting Room **FURNITURE**



MAGNETIC CHUCKS
Highest Quality, All Sizes—For All Types of Work. A Complete Line Of Rotary, Rectangular and Swivelling Magnetic Chucks.
35 Years Experience
Write for catalog and price list No. 11

O. S. WALKER CO., INC.
WOBURN AVE. WORCESTER, MASS.

L-R FLEXIBLE COUPLING
everlasting



Type "I-A" from $\frac{1}{4}$ " to 3" bores. (Other types to 14".) Non-lubricated—low cost—trouble-free—noiseless.

Write for test sample.

LOVEJOY TOOL WORKS
5007 WEST LAKE STREET CHICAGO, ILLINOIS

The New Stackbin Section
Patented



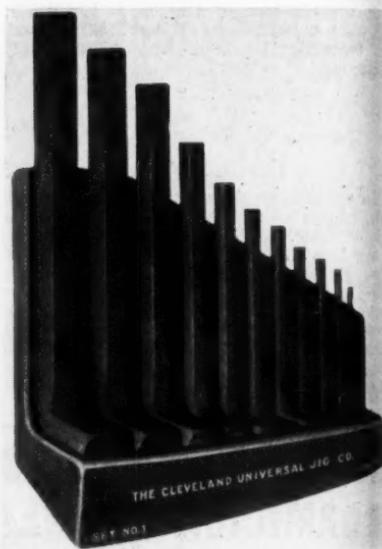
MAKES A STOCKROOM AS EASY TO BUILD AS A SECTIONAL BOOKCASE

The Stackbin Section is designed so that one-section-nests-into-the-other, and sections nest deeply enough so that several placed one on top of the other provides a substantial unit. Ideal for temporary stockrooms near the job. Base separate. Counter top can be supplied. Write for circular and prices.

STACKBIN CORPORATION
TROY ST. PROVIDENCE, R. I.

Cleveland Socket Wrench Holder

To eliminate time lost in looking for misplaced tools, the Cleveland Universal Jig Co., 13330 St. Clair Ave., Cleveland, Ohio, has developed the socket wrench holder shown in the illustration. The holder consists of a molded rubber composition base with a separate receptacle for each wrench. The bases are made in



Cleveland Socket Wrench Holder

two sizes. The larger size accommodates 11 wrenches from $3/32$ to $5/8$ in. across the flats and is intended for general machine shop use. The smaller set, designed for toolmaker's use, accommodates 8 wrenches within the above size range.

As the illustration shows, the design of the base is such that the wrenches are located at a slight angle; thus they remain in place but at the same time the desired size is selected instantly. Experimentation with bases of various materials has proven that the rubber composition is the most practicable due to the fact that it is not easily broken and will not mar anything with which it comes in contact.

Herc-Alloy Sling Chains

Sling chains made of heat treated alloy steel links, the manufacture of which is said to be an innovation in the chain

industry.

The

P-K
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Scr

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iron
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industry, have been placed on the market by Columbus McKinnon Chain Corporation, Tonawanda, N. Y. The chain, known as "Herc-Alloy," is said to possess an extremely high tensile strength due to the high grade of alloy steel used in its manufacture and the special heat treatment to which it is subjected. Thus a chain of a minimum size is said to have a safe working load considerably greater than has been available previously and lighter chains can be used to handle loads of a given weight. The chain is made entirely of alloy steel hooks, master link and joiner links, electrically welded by a process which provides the maximum of welded area.

The links are short and narrow, reducing to the minimum the danger of bending or gouging when slung around sharp corners. The hooks are also heat treated to provide the maximum strength at this important point. As an example of strength of Herc-Alloy Chain, the manufacturer states that $\frac{1}{2}$ -in. chain weighing 230 lbs. per ft. has a safe working load of 8480 lbs., is proof-tested at 14,144 lbs. and has been tested to an ultimate load of 28290 lbs.

P-K Hardened Metallic Drive Screw Welding Stud

To simplify the "studding" procedure used in welding cast iron to steel, repairing breaks in castings such as broken teeth in cast iron gears, welding cast iron by the steel metallic arc method, or other work requiring studs the Parker-Kalon

Corporation, 200 Varick St., New York, N. Y., has developed the P-K Hardened Metallic Screw Welding Stud.

The welding stud is used by driving it into a plain drilled hole, the stud cutting its own thread in the cast iron or steel as it is hammered into place. The manufacturer states that the device holds securely, and saves the time and labor ordinarily expended in tapping.

This development is an adaptation of the hardened metallic drive screw which is used by the metal working industry to eliminate tapping in assembly work. Samples of the P-K Hardened Metallic Drive Screw Welding Stud will be sent free upon request.

The New **SEVEN JEWEL**
FEDERAL
INDICATOR

LOW-FRICTION

for greater PRECISION

Just as the finest, most dependable watches have many jewels so do the New FEDERAL LOW-FRICTION indicators have full jewel bearings.

This new development in FEDERAL Indicators, together with other new details of construction, has resulted in an instrument which has greater accuracy than ever before.

Users already have found this LOW-FRICTION Indicator has saved them money on their problems of production and assembly. For further information write

FEDERAL PRODUCTS CORP.
1144 EDDY STREET PROVIDENCE, R. I.
DETROIT • CHICAGO • MUNCIE • CLEVELAND • NEW YORK

Foxboro Remote Valve Control

To supplement automatic control systems, The Foxboro Company, Foxboro, Mass., has developed a remote hand control with which automatic controllers governed by hand valves which are in locations that are not usually accessible may easily be adjusted. Under such a condition, a Foxboro remote hand control mounted on a centrally located panel enables the operator to manually adjust the degree of opening of an inaccessible valve without moving from his station. With this control he can reset a valve several hundred feet away

to control temperature, pressure flow or liquid level, using readings from his recording instruments as a guide in making the correct adjustments.

A feature of the remote hand control is the extreme precision of valve setting. Changes as small as $\frac{1}{4}$ -in. of water or less can be made in the pressure on the diaphragm motor of the control valve.



Foxboro Remote Valve Control

TOO
Rotary
Files
HIGH SPEED STEEL
HAND CUT--ALL SHAPES

SEND FOR ILLUSTRATED 10th Anniversary Catalog—showing multitudes of styles, shapes and cuts.

THE ROTARY FILE COMPANY
STRATFORD • CONN.

CRALEY OFF-SET
BORING HEAD

No. 4 Head for
Boring holes to
10" diameter.

These Boring
Head Sets are
made in six sizes.

Write
for
Prices

C. C. Craley Mfg. Co., Shillington, Pa.

This means that the valve opening can be altered by as little as a few thousandths of an inch to produce the exact desired flow of control medium. Used in conjunction with a "Stabilflo" valve, the control flow can be changed by less than 1 per cent. Due to its original unique design, there is no thumping or vibration; air pressure on the diaphragm is held exactly at the desired setting.

"AMERICAN" Amplifying Gauges

ACCURATE **FAST** **DEPENDABLE**

Years of service in the largest production plants prove the outstanding superiority of AMERICAN Amplifying Gauges for precision inspection of parts. Various models and special adaptations to suit your requirements.

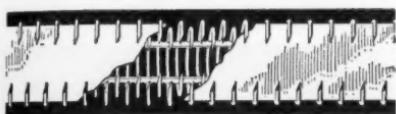
Write now for latest bulletin.

THE AMERICAN GAUGE CO.,
Dayton, Ohio

Simplicity and ruggedness mark both the design and construction of the Foxboro remote valve control. The instrument is finished in lacquered cast bronze trimmed with buff nickel.

Safety Belt Hooks Guarded in Packing

The sectional illustration below shows the new and improved manner developed by Safety Belt Lacer Co., Toledo Factories Bldg., Toledo, Ohio, for preparing



Showing Improved Method of Preparing Safety Belt Hooks for Packing

Safety Belt Hooks for box packing. In between each row of points a strip of cardboard is inserted which has the effect of giving each strip of hooks a flat bottom. Thus, no matter how much a box of hooks is jostled about in transportation, nor how hurriedly they are



REG. U. S. PAT. OFF.



U. S. PAT.
1,992,600

ALLIGATOR TRADE MARK REG. U. S. PAT. OFFICE BELT CUTTER

You simply PUSH the knife through the belt. Makes a clean, square cut of any belt (except metal stitched) up to 8 in. wide. Combined guard and hold-down clamp holds belt immovable. Knife will make several thousand cuts and is readily replaceable. Used as illustrated or horizontally. Weight 4 lbs. and 3 ozs. net. Order through your distributor.

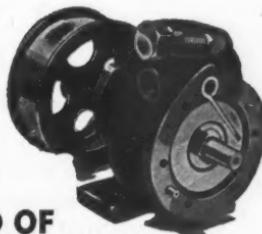
Sole Manufacturers
FLEXIBLE STEEL LACING CO.
4603 Lexington Street, Chicago
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The
Rollway
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THE OPERATOR!

That's the Rollway pump, always. Maintains at all times a vacuum of from 5 to 10 ft., depending on pump size. Never loses its prime.

Engineering Data Sheet

Send for Data Sheet for your files. If you want to handle lubricants or coolants economically and with fewest service interruptions, you'll want this Rollway sheet for reference.

PIONEER

ENGINEERING AND MFG. CO.

33 Melborn Avenue Detroit, Michigan
Also Centrifugal and Hydraulic Pumps



2, 3 & 4-way VALVES

For use on air, water, steam or oil for operating single and double acting cylinders, on pressures up to 5000 lbs. Made in Lever, Foot and Solenoid and Motor Operated types.

Bulletins on request

W. H. NICHOLSON & CO.
136 Oregon St., Wilkes-Barre, Pa.



Write for quotation on standard
Woodruff Keyway Cutters



Special Cutters made to
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QUALITY
TOOL WORKS

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Standardized
JIG BUSHINGS
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over 6700 items
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over 4200 items



Acme Drill Jig Bushings are made by the most exacting, scientific methods—insuring long wear, accurate fit, and absolute satisfaction. A standardized product, carried in stock for prompt delivery in over 10,900 standard items—all completely finished and ready for use. Special sizes made to order.

Send for bulletin, containing complete details, sizes available and low prices.

ACME
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COMPANY

421 N.
Carpenter St.
Chicago, Ill.



handled in the shop, each strip remains apart from the others, avoiding all tendency to telescope or engage in the box. It is contended that with this new method of packing, a partially used box of Safety Hooks may easily be kept in neat condition.

Fostoria No. 12 Coolant Filter

The Fostoria Pressed Steel Corporation, Fostoria, Ohio, has added a heavy duty unit, to be known as the No. 12 Model, to its line of coolant filters. A feature of the unit is a filtering bowl approximately 13 in. in diameter. According to



Fostoria No. 12 Coolant Filter

the manufacturer, the No. 12 Model will be supplied ready for installation, equipped with a floor stand and all necessary fittings for attachment to all grinders.

Grinding Paste and Soluble Grinding Oil Announced by Houghton

Two new products intended for use in precision and mirror finish grinding have been announced by E. F. Houghton & Co., 240 W. Somerset St., Philadelphia, Pa. These products are Houghton's Grinding Paste and Houghton's Soluble Grinding Oil.

Distinct advantages are cited including the prevention of rust, freedom from gumming or sludging, uniformity and stability, sterility and the ability to wet-out rapidly and penetrate to the point where work is being done. Chips wash away quickly and will settle out immediately. These products are readily soluble in water.

"Shield-Arc Eighty-five" High Tensile Strength Electrode

Welds with tensile strengths of 85,000 to 100,000 pounds per square inch can be made with the new arc welding electrode, "Shield-Arc Eighty-Five", just announced by The Lincoln Electric Company, Cleveland, Ohio. This electrode is designed especially for use on high tensile steels. Here it provides welds with tensile strength of 85,000 to 100,000 pounds and unusually high ductility. Ductility is from 15 per cent to 20 per cent elongation in two inches. The product of several years of research, this electrode makes possible the production of sound, economical welds of unusual strength.

"Shield-Arc Eighty-Five" is a heavily coated electrode of the shielded arc type. It is particularly suitable for the welding of those low alloy structural steels which, on normalizing, have tensile strengths under 100,000 lbs. per sq. in., — for example, Cromansil, low carbon nickel steels, structural silicon steels, low carbon manganese steels, Vanadium steels, and in general, all low alloy steels under .30 per cent carbon.

It is obvious that the chemical composition of the plate being welded will affect the tensile strength and ductility of the weld. When deposited in mild steel plate, the weld metal will have a tensile strength of approximately 78,000 to 85,000 lbs. per square inch, yield point 60,000 to 70,000 lbs. per square inch, and 15 to 20

per cent elongation in two inches in the as-welded condition.

Welds in high tensile plate will have a higher strength than that given above; for example, the following results were obtained in welds made in $\frac{3}{8}$ in. Cromansil plate:

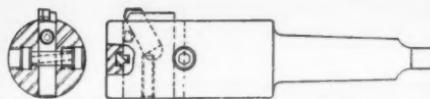
Type of Weld

Butt Weld Machined flush with plate. Yield Point. Free Bend Test. Elongation of outside fibres.

As Welded

Tensile strength 89,600 lbs. per square

DAVIS BORING TOOLS



NEW SUPER MICROMETER EXPANSION BORING TOOL

ACCURACY: Tool is precision built, assuring extremely accurate results.

INTERCHANGEABILITY: Uniformity of design and structure of blocks and cutters allow a rapid and accurate change of set-up.

RUGGED CONSTRUCTION: Rigidly constructed, permits with safety increased speeds and feeds.

ECONOMICAL: Tools are universal in application, one tool covering a wide range of bores. Furnished in sizes for boring diameters $\frac{3}{4}$ " to 5". Extremely effective when equipped with Tungsten Carbide Tipped cutters.

MICROMETER ADJUSTMENT: Minute adjustment which permits as fine as .00025" adjustment on diameter.

DAVIS BORING TOOL CO., Inc.

ST. LOUIS, MO.

inch broke in plate. 62,900 lbs. per square inch plate. 25 per cent.

Stress Relieved

58,600 lbs. per square inch, 32 per cent. through center of weld. Elongation in 1 inch across weld—34.4 per cent. 58,699 lbs. per square inch. 32 per cent.

"Shield Arc Eighty Five" is suitable for flat, vertical and overhead welding, and is available in 5/32 in. and 3/16 in. sizes. For most vertical and overhead welding the 5/32 in. size is preferred; however, for vertical welds in thick plate 3/16 in. may be used.

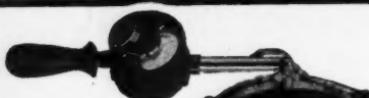
ONE PIECE OR A MILLION
IF IT CAN BE
CENTERLESS GROUND
We Can Do It!

ESTIMATES CHEERFULLY
GIVEN FROM BLUE
PRINTS OR
SAMPLES

**CENTERLESS
GRINDING**

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CENTERLESS GRINDING CO.
14632 SCHAEFER ROAD, DETROIT, MICHIGAN

PYRO THE IMPROVED
SURFACE PYROMETER



A Self-contained, Rugged, Quick-Acting, Accurate Precision Instrument for Curved or Flat, Stationary or Moving Surfaces.

Due to patented clamping-device embodied in indicator—A PYRO FEATURE—contact and reading of actual temperatures no longer have to be made simultaneously. Write for Bul. No. 60.

THE PYROMETER INSTRUMENT CO.
101-105 Lafayette St., New York

Barrett-Cravens Pallet Type Tin Plate Truck

A hand operated lift truck designed to handle low 3 1/2-in. pallets of tin plate, strip steel and other products which are supported on pallets has been brought out by the Barrett-Cravens Co., 3255 W. 30th St., Chicago, Ill. The truck, illustrated herewith, is built in capacities of 2500 and 3500 lbs. The fork-type carrying frame is 15 in. wide overall with



Barrett-Cravens Pallet Type Tin Plate Truck

5-in. space between the two forks. The low 3 1/2-in. frame permits handling skids or pallets with a 4-in. clearance.

The dual wheels in the rear are compensated for rough floors and ball bearing equipped. The large 7-in. diameter front wheels are actuated by a large kingbolt set on a low, integral turntable. The 2 1/4-in. lift is accom-

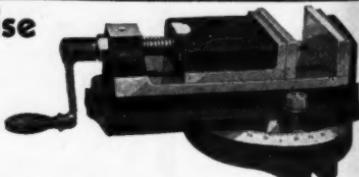
L-W Milling Machine Vise

\$29.50 Most outstanding value
on the market

85 lb. Semi-Steel flanged construction.
6 1/2" Jaws—Hardened and Ground.
2" Depth of Jaws. 4 1/4" Opening of Jaws.
1" Steel Screw and Bronze Nut.

● DIVIDING HEADS ● MAGNETIC CHUCKS ● MILLING MACHINE VISES ●
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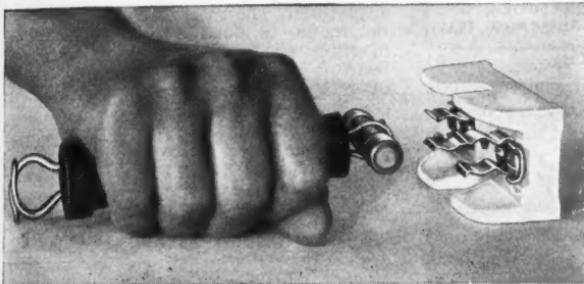
L-W CHUCK CO., No. 20 N. St. Clair St., Toledo, O.



lished by one stroke of the handle. Other features include an adjustable lifting mechanism, wide-spread front wheels, spring handle hold-up and a vertical type oil release check.

"Non-Shock" Cartridge Fuse Puller and Inserter

The illustration shows a non-shock cartridge fuse puller and inserter for

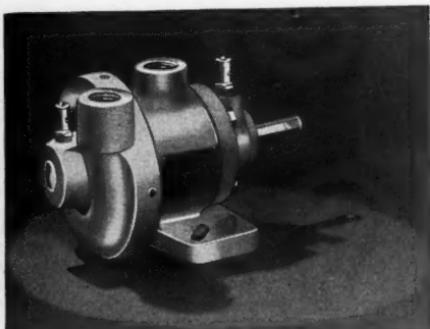


"Non-Shock" Cartridge Fuse Puller and Inserter

30 to 60 ampere fuses which has been placed on the market by the Union In-

sulating Co., 277 Broadway, New York, N. Y. The puller comprises several spring steel pulling wires, so molded into high grade tough durable soft rubber as to prevent their pulling out while at the same time insulating the user against shock. To pull a cartridge fuse, the spring wires are placed in position about the fuse, the puller is given a half turn and the fuse is easily pulled from its holders. To insert the fuse, the fuse is placed in position between the spring wires, then pressed into place in the contact clips. A half turn and pull releases the inserter. The puller is designed to take 30 ampere fuses at one end and 60 ampere fuses at the other. The handle is corrugated and shaped to fit the hand and thumb, providing a firm non-slipping grip. The puller is 6 1/2 in. long overall and 1 1/8 in.

in. diameter. The pullers are packed in individual cartons.



THE TOMKINS-JOHNSON CO.
620 North Mechanic Street,
Jackson, Michigan

Spiral-Flo PUMPS

FOR PUMPING
OIL OR WATER
OR ANY COMBI-
NATION OF THE
TWO.

These pumps have no gears to wear. They pump coolant impregnated with chips, they are simple in construction, they are really durable.

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Bulletin No. 5?

inch broke in plate. 62,900 lbs. per square inch plate. 25 per cent.

Stress Relieved

58,600 lbs. per square inch, 32 per cent. through center of weld. Elongation in 1 inch across weld—34.4 per cent. 58,699 lbs. per square inch. 32 per cent.

"Shield Arc Eighty Five" is suitable for flat, vertical and overhead welding, and is available in 5/32 in. and 3/16 in. sizes. For most vertical and overhead welding the 5/32 in. size is preferred; however, for vertical welds in thick plate 3/16 in. may be used.

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\$29.50

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6 1/2" Jaws—Harden and Ground.
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L-W CHUCK CO., No. 20 N. St. Clair St., Toledo, O.

**Barrett-Cravens Pallet Type Tin
Plate Truck**

A hand operated lift truck designed to handle low 3 1/2-in. pallets of tin plate, strip steel and other products which are supported on pallets has been brought out by the Barrett-Cravens Co., 3255 W. 30th St., Chicago, Ill. The truck, illustrated herewith, is built in capacities of 2500 and 3500 lbs. The fork-type carrying frame is 15 in. wide overall with a



Barrett-Cravens Pallet Type Tin Plate Truck

5-in. space between the two forks. The low 3 1/2-in. frame permits handling skids or pallets with a 4-in. clearance.

The dual wheels in the rear are full compensating for rough floors and are ball bearing equipped. The large 7-in. diameter front wheels are actuated on a large kingbolt set on a low, large turntable. The 2 1/4-in. lift is accom-

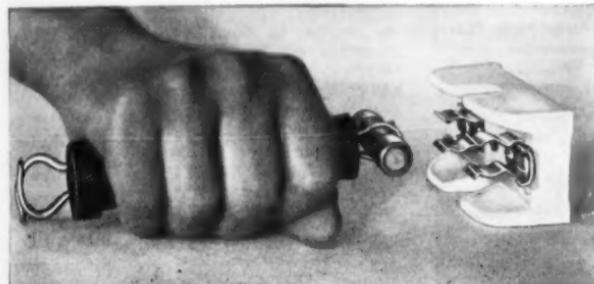


Tin
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plished by one stroke of the handle. Other features include an adjustable lifting mechanism, wide-spread front wheels, spring handle hold-up and a vertical type oil release check.

"Non-Shock" Cartridge Fuse Puller and Inserter

The illustration shows a non-shock cartridge fuse puller and inserter for



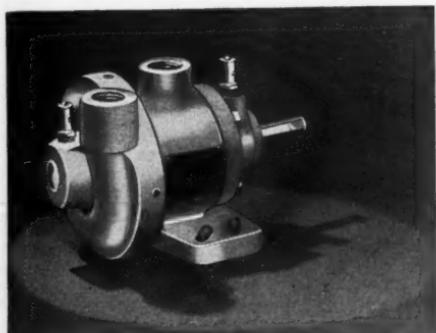
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in. diameter. The pullers are packed in individual cartons.



THE TOMKINS-JOHNSON CO.
620 North Mechanic Street,
Jackson, Michigan

Spiral-Flo PUMPS

FOR PUMPING
OIL OR WATER
OR ANY COMBI-
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TWO.

These pumps have no gears to wear. They pump coolant impregnated with chips, they are simple in construction, they are really durable.

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Pyrometers
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Furnace

Price complete with
protective tube. **\$13 to
\$36.00 and up**

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146 W. Austin Ave. **CHICAGO, ILL.**

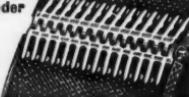
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Bushings, Inc.**

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DETROIT, MICH.



Trico Drip-Drop Oiler

The Trico Fuse Mfg. Co., 2950 N. 5th St., Milwaukee, Wis., announces a Drip-Drop Oiler with feed control for solid, wick and waste-packed bearings, the control being so flexible as to meet the exacting requirements of bearings varying in size, speed and temperature. By means of a simple adjustment the oiler can be made to feed slow, medium or fast, as the bearing may require. The oiler is designed to fit 95 per cent of installations without drilling or tapping. The oiler is made in three sizes.



Trico Drip-Drop
Oiler

Waldron Gear Type Flexible Couplings

The John Waldron Corporation, Dept. M, New Brunswick, N. J., makers of Francke Flexible Couplings, are now marketing an addition to their coupling line to be known as the Waldron Gear Type Flexible Couplings. Two designs—the Medium Duty and the Torque Ring—are included.

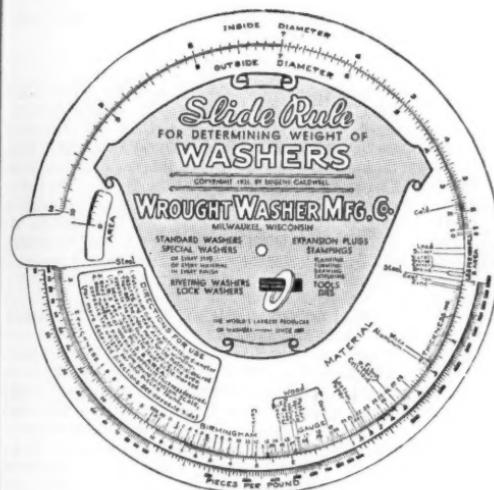
The Medium Duty type incorporates the conventional double engagement principle. It is designed to function on prime or second movers on all classes of equipment as well as simply transmitting power in the small bore range of 1 in. to 3½ in. inclusive. The Torque Ring type employs the principle of quadruple engagement. It is rugged, close-coupled, finished all over and designed for the heavy duty, slow speed field.

These couplings take care of angular and direct off-set misalignment and combination of the two, as well as provide for independent lateral float of the connected shafts. The misalignment capacity of the Waldron Gear Coupling is said to be far in excess of permissible operating conditions.

The Waldron Gear Couplings are made of high grade forgings throughout, except in the larger sizes where steel castings are used for the hub and sleeves.

Slide Rule for Measuring Washers

A time-saving slide rule, illustrated herewith, has been developed by the Wrought Washer Mfg. Co., 2201 S. Bay St., Milwaukee, Wis. This slide rule automatically calculates weight per thou-



Wrought Washer Slide Rule

sand pieces or pieces per pound of any size washer in materials including steel, brass, copper, aluminum, fibre, paper, and other commercial materials.

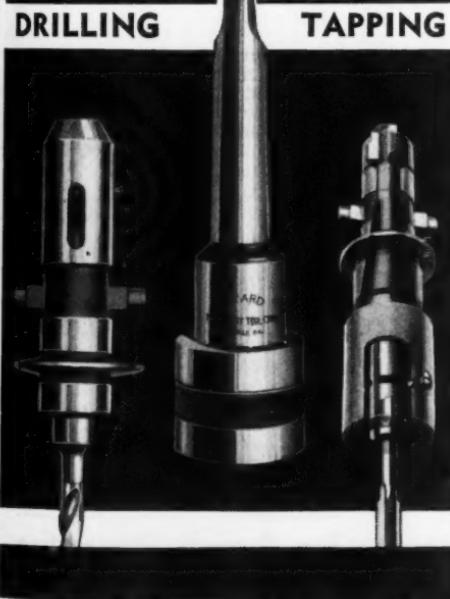
The slide rule will be mailed free of charge to firms making their requests on company letterheads.

Bright Zinc Plating Finish Produced by "Mazic" Process

Zinc is claimed by some manufacturers to afford first-class protection against rust. The wide application of zinc plating has, however, been delayed by lack of a plating method which would produce a bright, rather than white, finish and which would be easy to maintain.

The "Mazic Process" of bright zinc plating which has been developed by the Hanson-Van Winkle-Munning Co. of Matawan, N. J., permits heavy deposits from a cyanide solution and is said to give satisfactory results in steel tank, semi-automatic and full automatic plating systems. The plate is truly bright and is said to compare favorably with the best cadmium finishes.

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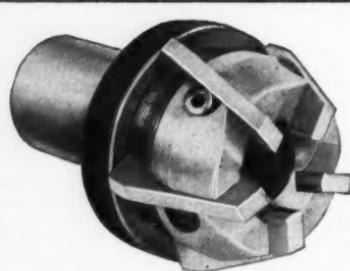
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P & W No. 12B HIGH SPEED VERTICAL MILLER AND PROFILER BULLETIN. A complete description with table of specifications of the No. 12B High Speed Vertical Miller and Profiler is included in this bulletin which can be had by addressing Pratt & Whitney



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SEVEN DIFFERENT STYLES*

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Division, Niles-Bement-Pond Company, Hartford, Conn.

WALDRON GEAR TYPE FLEXIBLE COUPLING CATALOG. This catalog, covering the complete line of Waldron Gear Type Flexible Couplings, has been issued by the John Waldron Corporation, Dept. M, New Brunswick, N. J. Full diagrams, tables of ratings and complete description of the types of couplings are contained in the book. Copy available to any executive upon request.

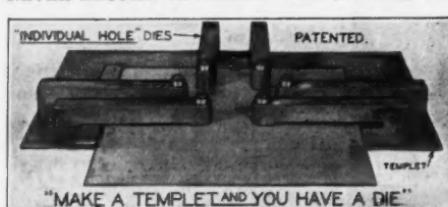
WALDRON SILENT STEEL GEAR BULLETIN No. 71. This 12-page bulletin, issued by Dept. M, John Waldron Corporation, New Brunswick, N. J., illustrates and describes in detail the silent steel gears made by this firm. Included also are tables giving the dimensions of various sizes of blanks, general directions for selecting sizes and directions for machining these gears. Copy free upon request.

CONTINUOUS HINGE CHART. This chart, now being issued by Auto Moulding & Mfg. Co., 2326 S. Canal St., Chicago, Ill., has been issued for convenience in selecting types and sizes of continuous hinges for special purposes. The chart lists 23 different types of hinges, giving the diameter of the pin whether plain or offset, approximate length of joints in inches, maximum available width, minimum available width, and decimal thickness of metal. Illustrations show the different types of continuous hinges. Copy free upon request.

FACTS ABOUT METAL POLISHING. Users of abrasives will be interested in this book which has just been issued by the Norton Company, Worcester.

WALES ADJUSTABLE HOLE PUNCHING DIES

NEVER BECOME OBSOLETE. When you change models you reset them to make the new parts.



Small runs are made on BENCH set-up, holes in straight lines on PRESS BRAKES, and holes scattered over parts on PUNCH PRESSES. These "INDIVIDUAL HOLE" dies are self contained with the punch and die in the same holder, thus eliminating die setting. Will punch $\frac{1}{8}$ " holes in 14 gauge steel or under.

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SHING. sted in issued Worcester.

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Mass. Among the subjects covered, as evidenced by the chapter headings, are: Physical Properties Required in Abrasive Grain; Preparation of Glue; Setting Up Polishing Wheels; Correct Drying; Polishing Different Metals. The book also includes a table of recommended grain sizes for various types and kinds of work. Copy free upon request.

MAKE YOUR CHASERS LAST LONGER. Chasers that are sharpened frequently and which are sharpened uniformly and accurately will give much longer and better service than those which are neglected, according to a booklet which is now being issued by The Geometric Tool Company, 3 Valley St., New Haven, Conn. The booklet describes the Geometric Style E Grinding Fixture, explains its uses, and tells in simple but effective language just how to operate it. Copy free upon request.

BALL BEARINGS AND HEAVY DUTY ROLLER BEARINGS ENGINEERING MANUAL No. 35. This manual, published by The Fafnir Bearing Company, New Britain, Conn., contains 197 pages

of 8½x11 in. size comprising a comprehensive review of the principles affecting the selection, application and operation of anti-friction bearings and ball bearings in particular.

Of particular interest to machine designers and production engineers is a complete and up-to-date resume of the engineering fundamentals involved in the correlation of design requirements, load characteristics, service conditions to the choice of the particular size and type of bearing. The text includes a complete tabulation of bearing characteristics, dimensions and capacities which provide a basis for an analysis of practically any bearing problem.

The book is divided into five sections. Section 1 reviews the history and development of anti-friction bearings, with particular emphasis on the improvement in characteristics which have expanded their fields of usefulness. In Section 2, 30 pages are devoted to a broad analysis of bearing selection on the basis of type and size. Section 3, totalling 118 pages, reviews in detail the dimensions, load ratings and functional characteristics of a complete list of bearing types and sizes including industrial pillow blocks and roller bearings, also ball bearings.

IN THOUSANDS OF SHOPS OF TASKS



"HERCULES TOOLS"
THE BUCKEYE PORTABLE TOOL CO., DAYTON, OHIO

Section 4 comprises a thorough review of shaft-fitting methods, housing and mounting instructions, and advice on lubrication. The manual is available without charge to executives and engineers who will address their requests on their company letterheads.

DISSTON METAL-CUTTING BAND SAWS; Their Selection and Care. Henry Disston & Sons, Inc., 1221 Tracony, St., Philadelphia Pa., is issuing a series of "product manuals", each being devoted to the selection, use and care of a single type of cutting tool. The entire set of

manuals is issued in a convenient form with perforations for binding into a loose leaf folder.

The first of these manuals, titled as above, describes the characteristics of various kinds of metal-cutting band saws, tells the uses for which each is especially adapted, gives the gauges and sizes, information regarding speeds and feeds, minimum of radius that can be cut, the tension or strain in pounds that can be applied to various widths of blades, sizes of blades that should be used with different sawing machines (listed by manufacturers' names), recommended specifications for cutting specific materials, and general but useful information about cutting with circular saws, band saws, and hack saws. A copy of this manual will be sent free upon request.

BOSTON CATALOG No. 50. Boston Power Transmission Products including gears, speed reducers, chain drives, ball bearings, couplings, universal joints, lubricators, pillow blocks, pulleys, racks and other transmission equipment made and marketed by Boston Gear Works Inc., North Quincy, Mass., are described and illustrated in this 240-page book. Specifications are given for each type and size of product, together with list prices. The book also contains, in addition to detailed directions of the various pieces of equipment, general information regarding methods of ordering. Copy free upon request.

New "D & W" Chuck

Style S-7 x 17



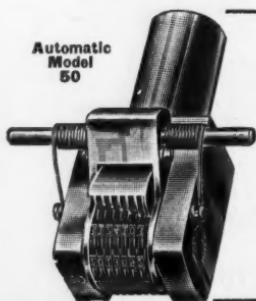
A sturdy, dependable chuck, 3 9/16" high to meet demand for lower chuck than our standard F-7 x 16.

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Model
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reader a good idea of the possibilities of this piece of equipment. The turret is arranged for either four or six tools bolted to the rear of the lathe carriage. Copy of the insert free upon request.

BUNTING CATALOG OF BRONZE BEARINGS AND BEARING METALS. This 1936 catalog of Bunting products, issued by The Bunting Brass & Bronze Company, Toledo, Ohio, is said by this company to be the most complete catalog of bronze bearings, bearing metals

and data ever issued. This single book makes instantly available a vast assortment and stock of finished bearings, metals and services representing products, materials and specialized knowledge which is of value to the user of bearings and bushings.

The catalog lists over 600 different sizes of Bunting Bronze Standardized Bearings, completely machined and finished ready for assembly, carried in stock to meet practically every need in production, repair and maintenance of all mechanical and electrical motor units. The book also lists 121 stock



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20 years

ARGUTO

without

a drink

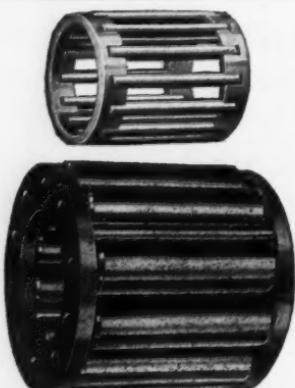
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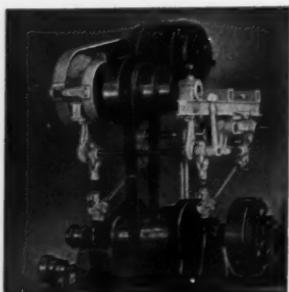
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sizes of machined and centered cored and solid bronze bars in 13-in. lengths. Bunting Industrial Babbitt is a new anti-friction metal which is also discussed. Included are data on special designs and alloys, oil grooving, graphiting, and Bunting engineering services. Copy free upon request.

Disston Hack Saw Blades; Their Selection and Care. This 4-page catalog insert, one of a series being issued by Henry Disston & Sons, Inc., 521 Tacony St., Philadelphia, Pa., explains the difference in the characteristics of different types and kinds of hack saw blades and gives the reader instructions which are intended to be of assistance to him in the selection of blades for his particular job. The folder explains the difference in the number and set of the teeth and how to select a blade which will work to best advantage on any kind of metal. It also enumerates the common abuses of power hack saw blades and explains the reasons for failure. Suggestions are given for obtaining the best results from hand and power hack saws. Copy free upon request.

Speeding Production with Hercules Air Tools. Catalog No. 30, now being issued by The Buckeye Portable Tool Co., Dayton, Ohio, is a complete outline of the Hercules grinders, sanders, buffers, polishing tools, lapping tools, drills, screw drivers, nut setters, and other tools made by this firm. In addition to describing and illustrating the various kinds of tools, the book contains an interesting chapter in which all the features of design of the Hercules line of tools are described. The book also contains a chapter on care, service and repairs, and closes with a section in which nut drivers, grinding wheels, wire brush wheels, buffing wheels, cutting disks, and other



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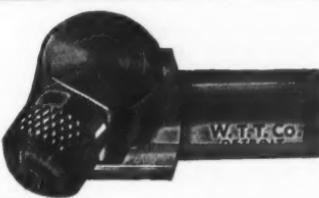
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Every user of diamond dressing tools should investigate the TRU-CO Wheel Dresser. In addition to its economy, it is highly efficient, unusually flexible, strongly built and long in life. Diamond always remains sharp.

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For External, Internal and Surface Grinding Machines.

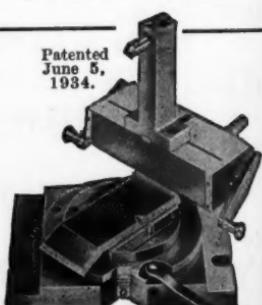
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ALLIS-CHALMERS LEAFLET No. 2218. This 4-page leaflet now being issued by Allis-Chalmers Mfg. Co., Milwaukee, Wis., describes and illustrates the "Ro-Twin" Air Compressors which are now being made by this firm. Included in the text are specifications, a table of capacities and approximate dimensions. Copy free upon request.

BOYE & EMMES LATHES. Bulletin No. 25, now being issued by the Boye & Emmes Machine Tool Co., Cincinnati, Ohio, presents a detailed description, with illustrations, of the parts included in the design of Boye & Emmes Lathes. Every part of the lathe mechanism is explained in detail, together with the attachments which are available for use with these lathes. Copy free upon request.

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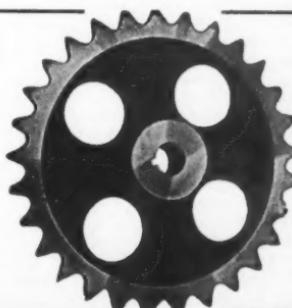
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